FIG. 1

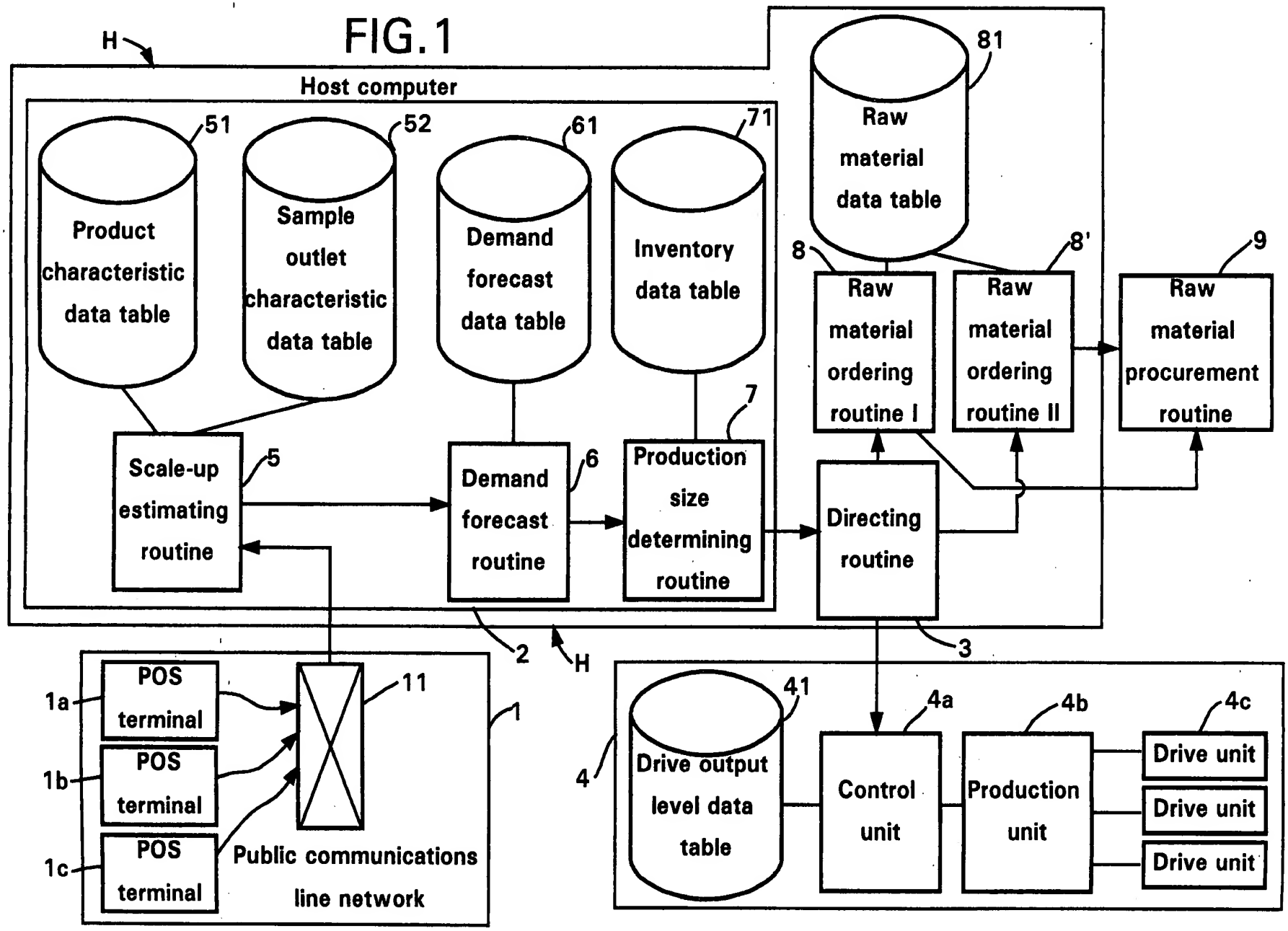
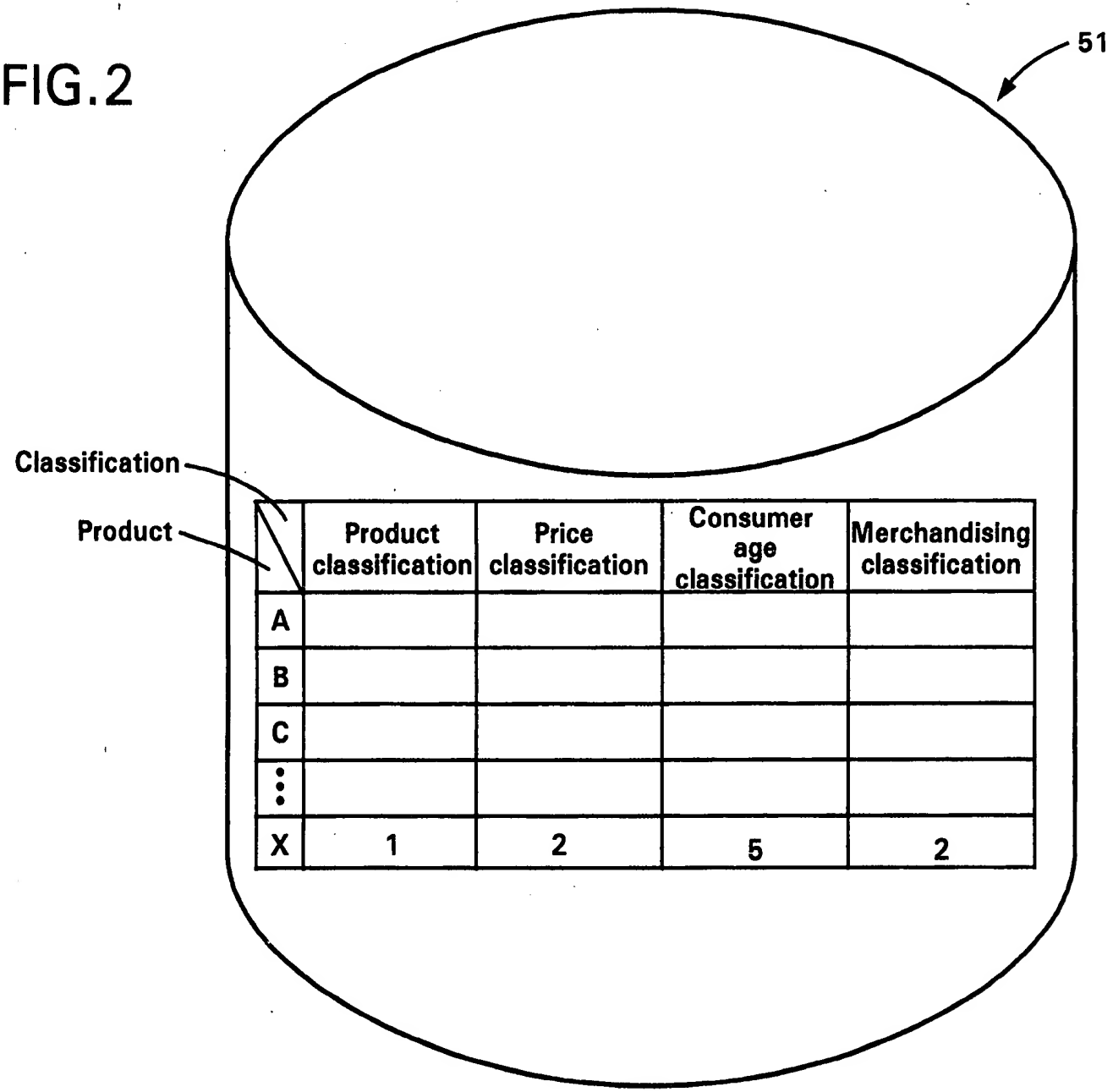


FIG.2



	Product classification	Price classification	Consumer age classification	Merchandising classification
A				
B				
C				
⋮				
X	1	2	5	2

FIG.3

Product classification

Foundation cosmetic	Make up cosmetic	Shampoo & rinse	Perfume & cologne	Cosmetic sundry	Men's cosmetic
1	2	3	4	5	6

Price classification

Low	Medium low	Medium	Medium high	High
1	2	3	4	5

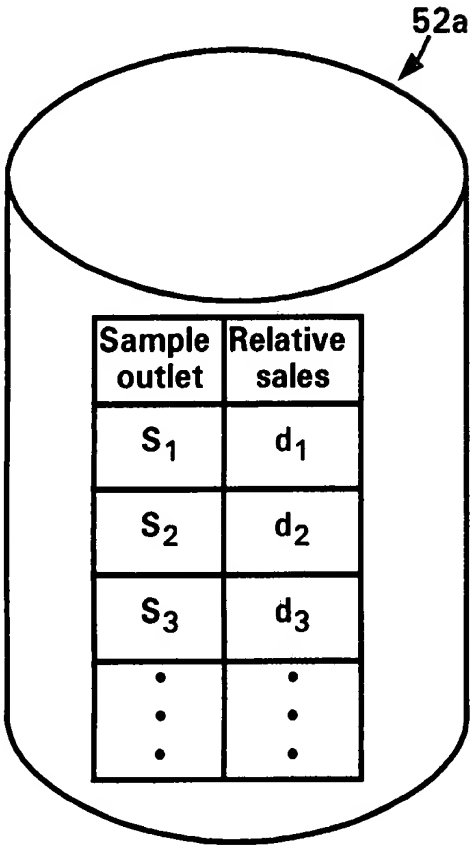
Consumer age classification

Low	Intermediate between low and average	Average	Intermediate between average and high	High
1	2	3	4	5

Merchandising classification

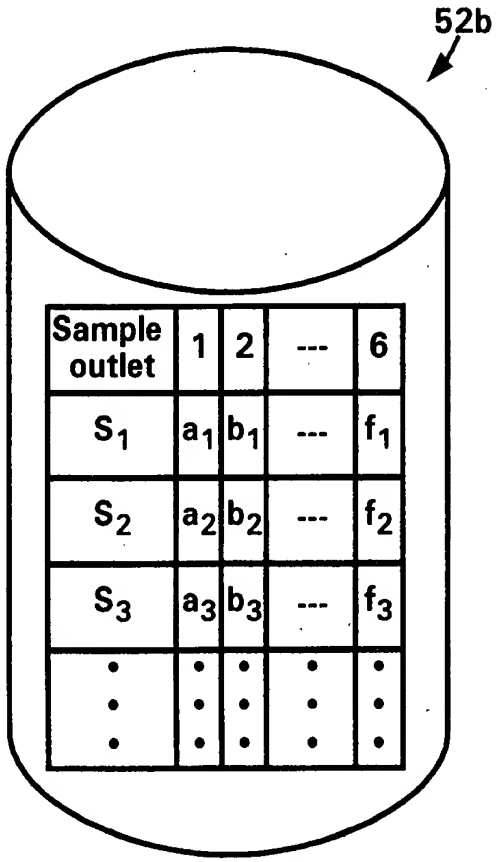
Display sale	Rather display sale	Equivocal	Rather counseling sale	Counseling sale
1	2	3	4	5

FIG.4A



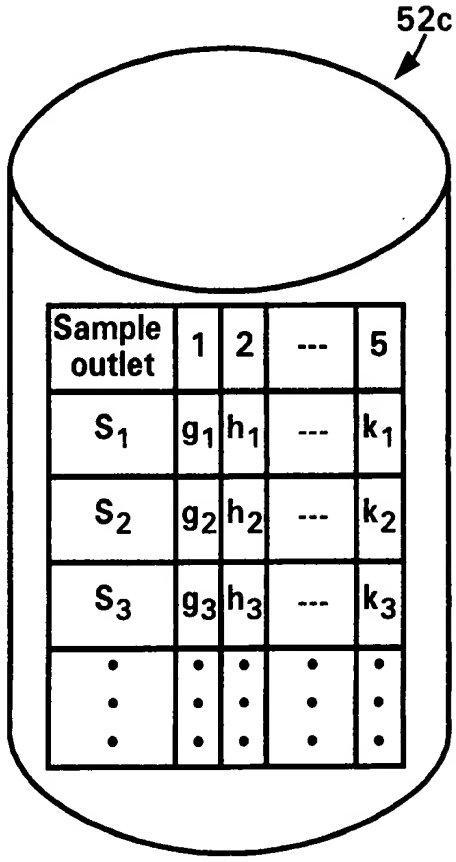
Relative sale

FIG.4B



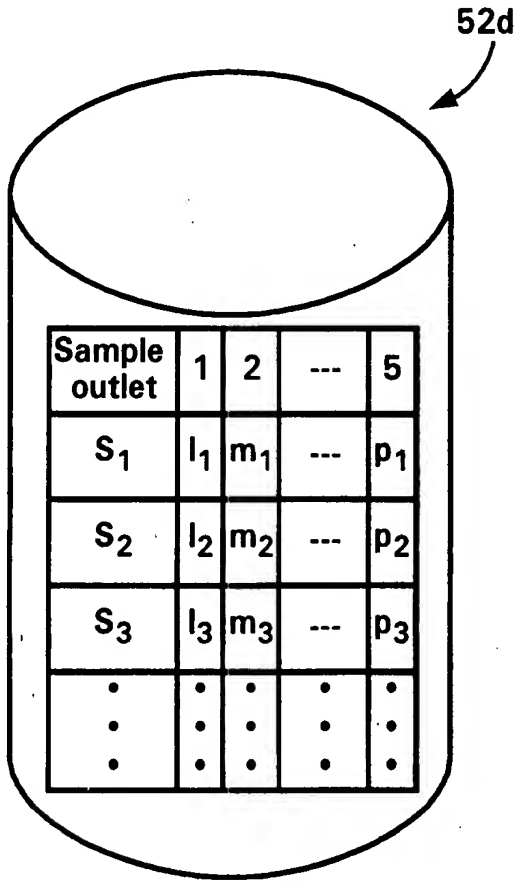
Product characteristic

FIG.4C



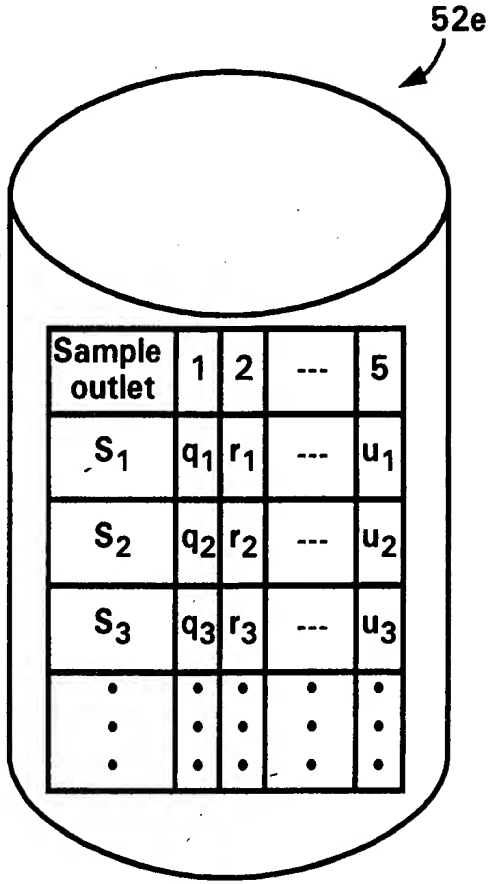
Price characteristic

FIG.4D



Consumer age characteristic

FIG.4E



Merchandising characteristic

FIG.5A

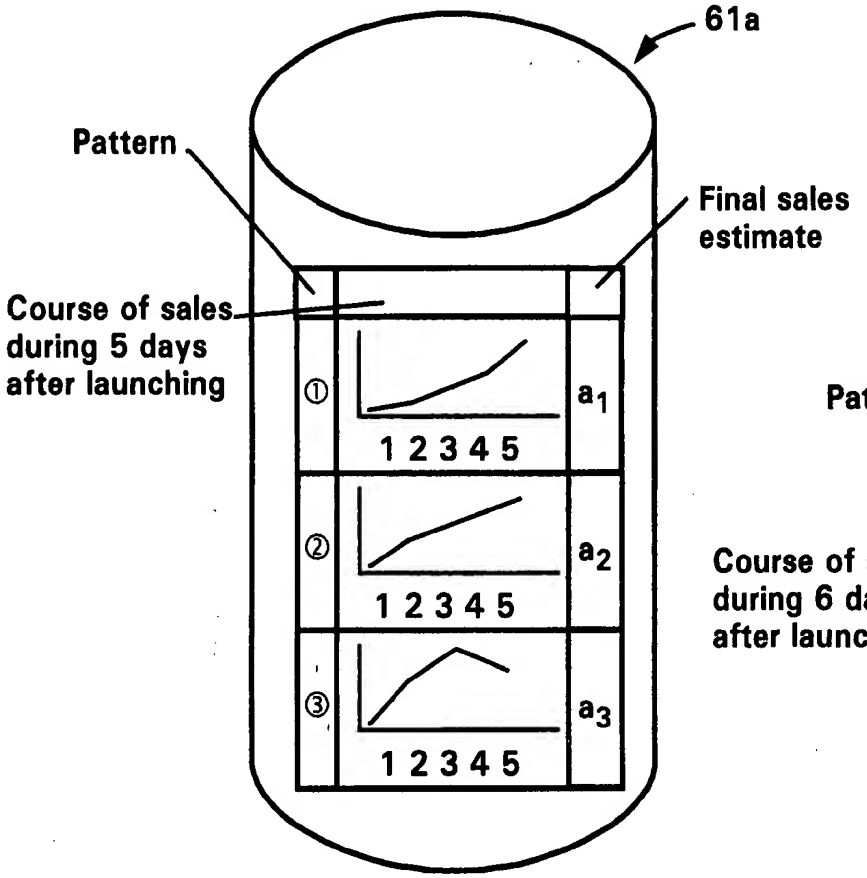


FIG.7

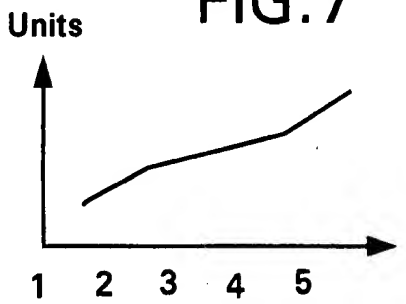


FIG.5B

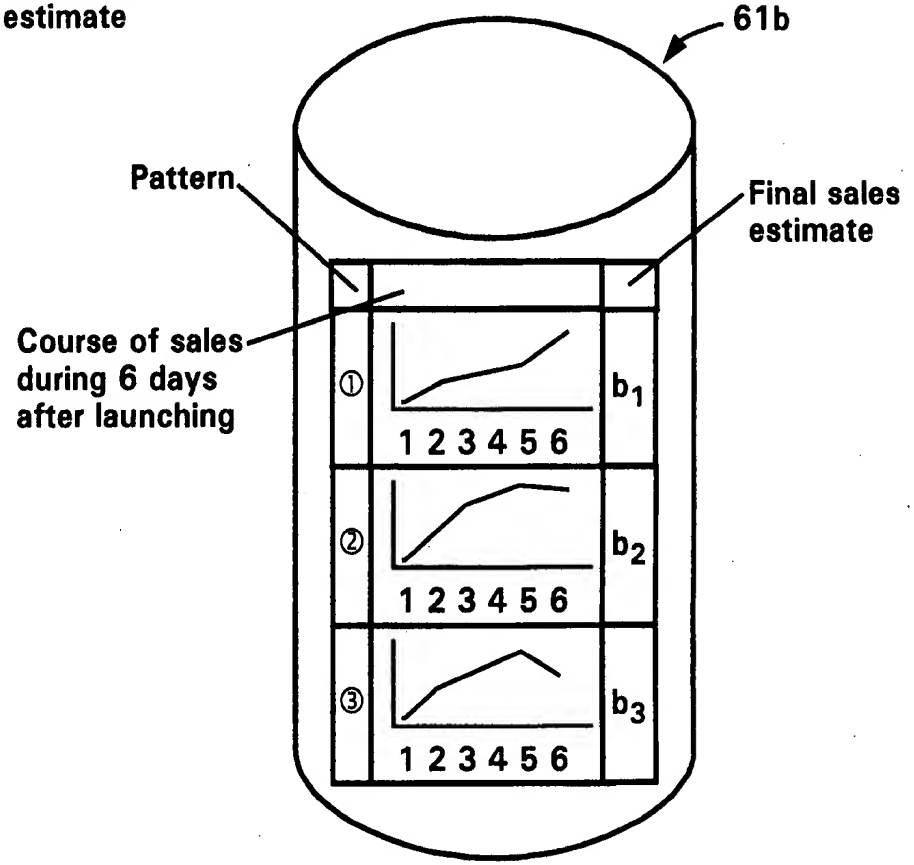


FIG.6

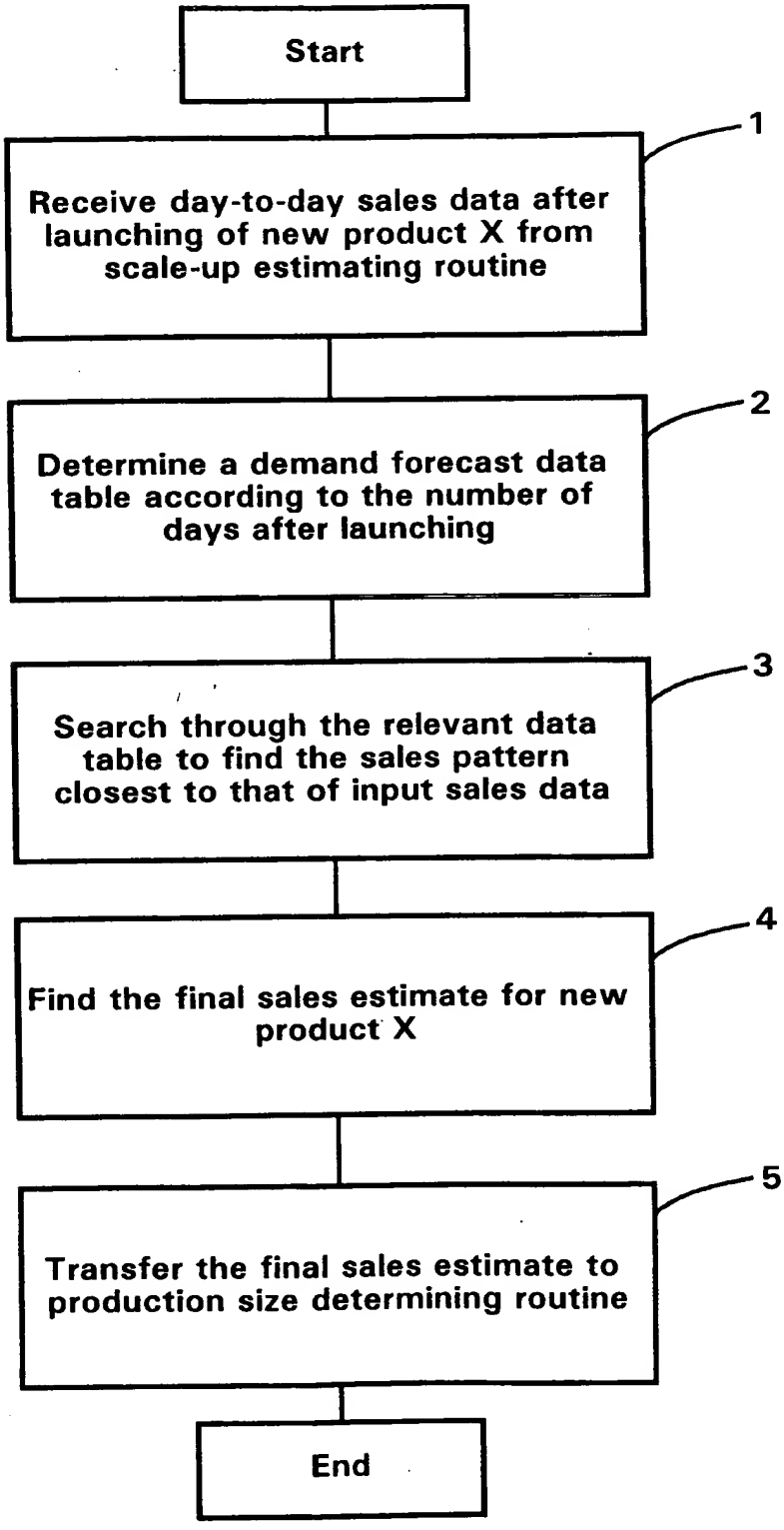
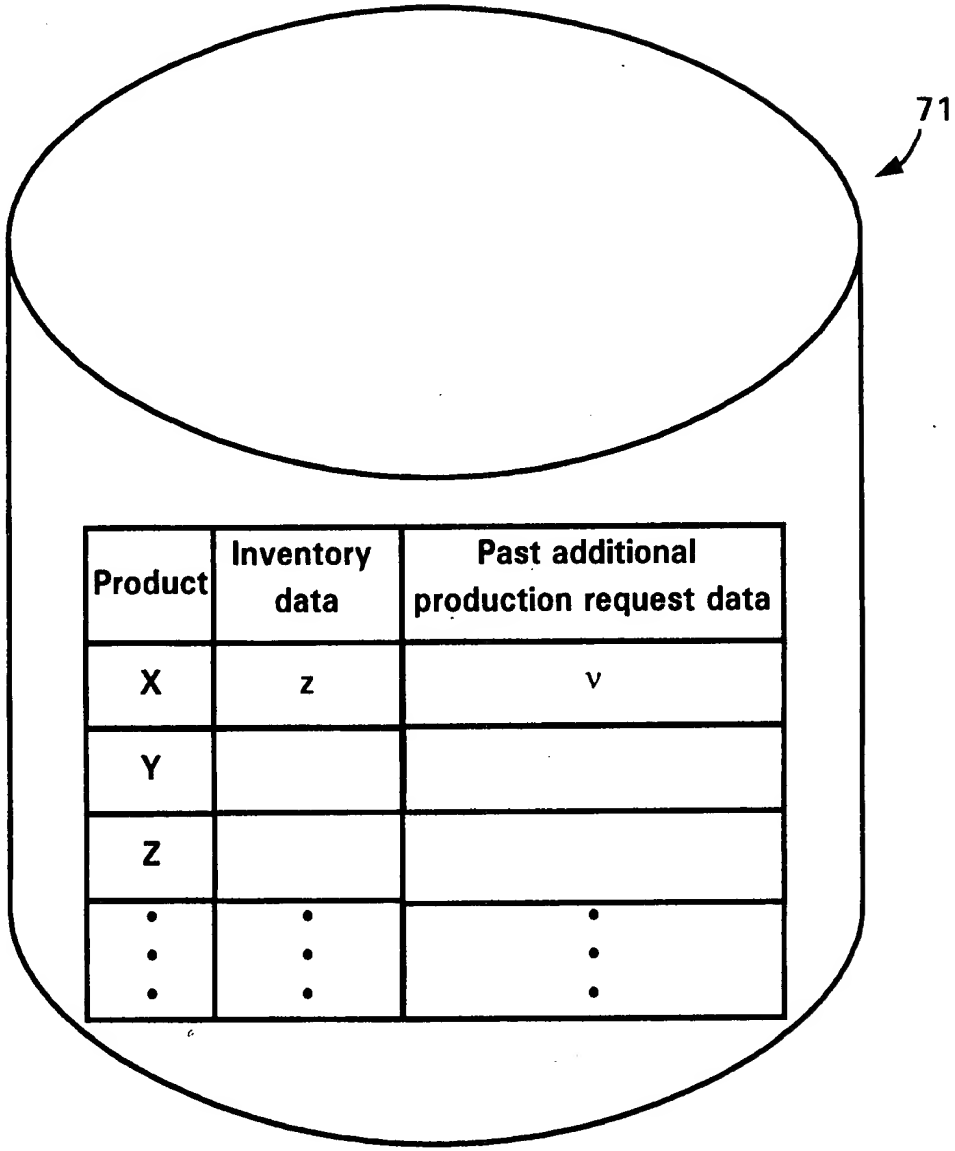

Start
1
Receive day-to-day sales data after launching of new product X from scale-up estimating routine
2
Determine a demand forecast data table according to the number of days after launching
3
Search through the relevant data table to find the sales pattern closest to that of input sales data
4
Find the final sales estimate for new product X
5
Transfer the final sales estimate to production size determining routine
End

FIG.8



Product	Inventory data	Past additional production request data
X	z	v
Y		
Z		
• • •	• • •	• • •

FIG.9

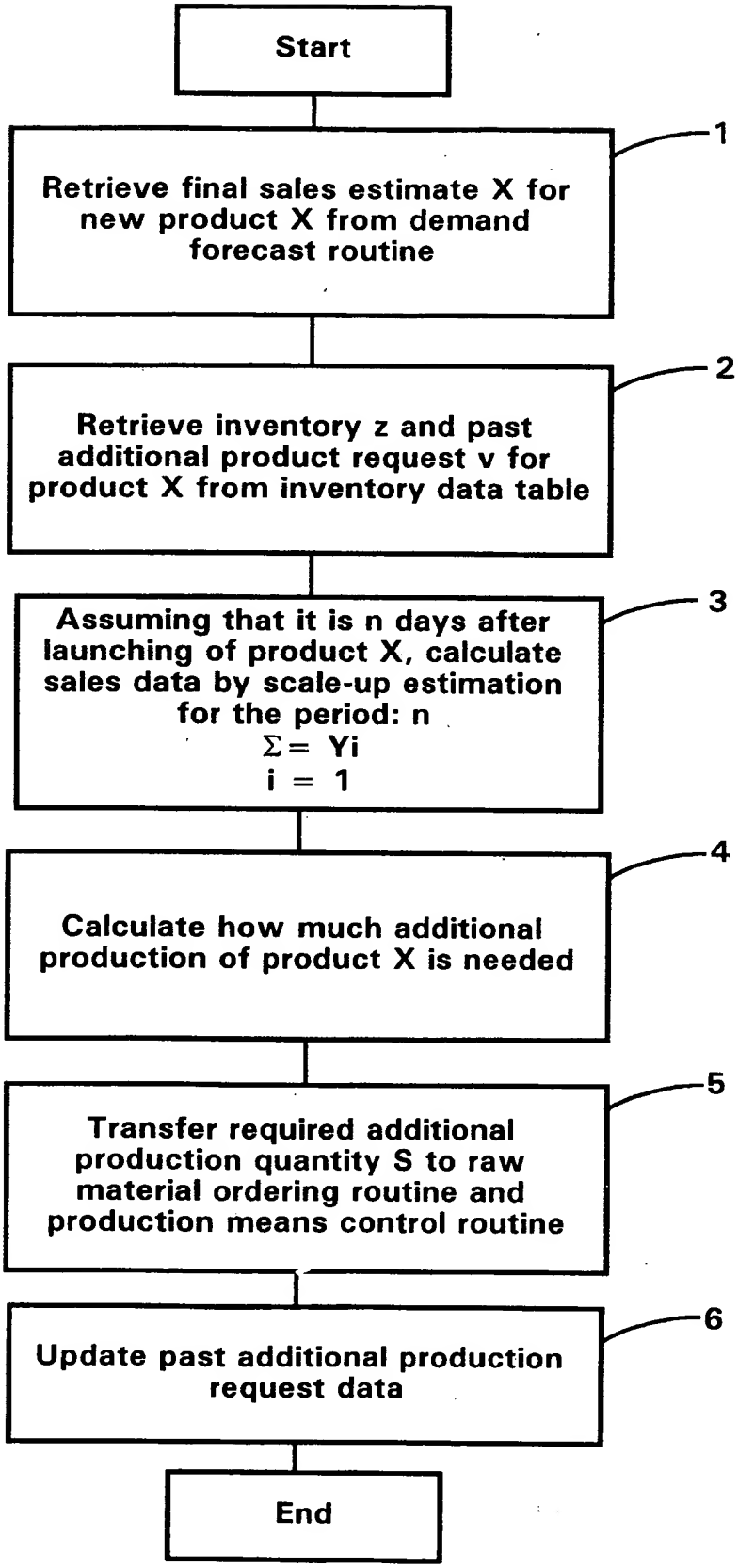
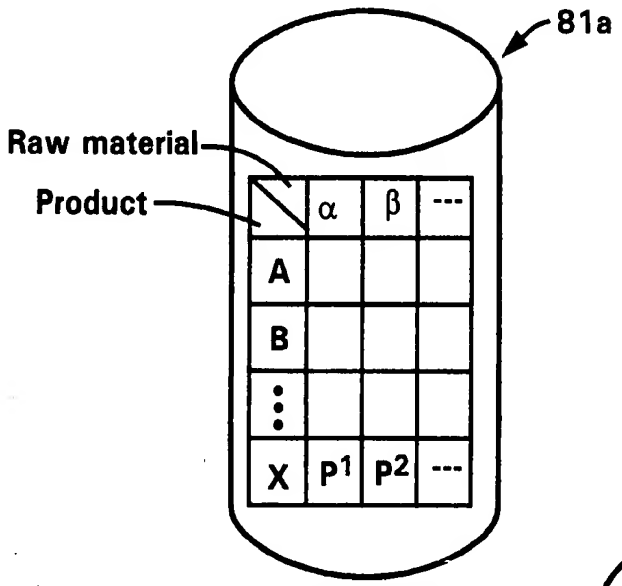
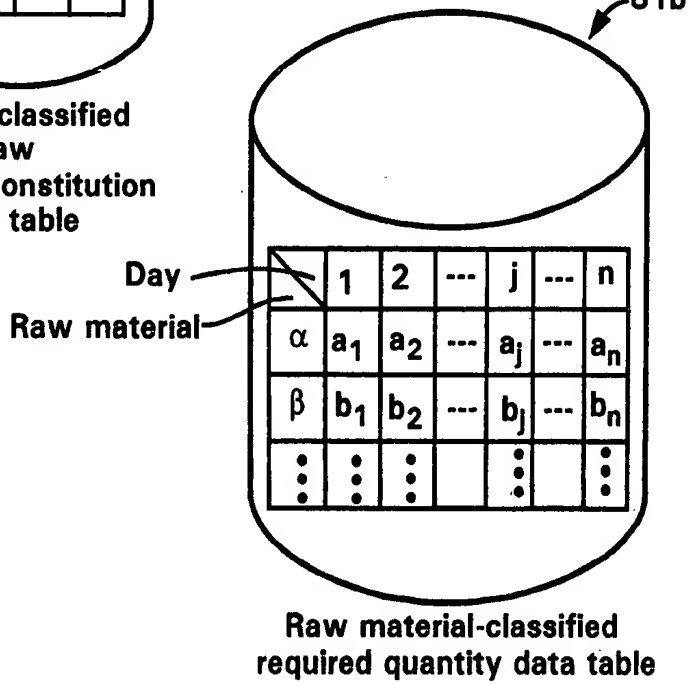

Start
Retrieve final sales estimate X for new product X from demand forecast routine
1
Retrieve inventory z and past additional product request v for product X from inventory data table
2
Assuming that it is n days after launching of product X, calculate sales data by scale-up estimation for the period: n
Σ = Yi
i = 1
3
Calculate how much additional production of product X is needed
4
Transfer required additional production quantity S to raw material ordering routine and production means control routine
5
Update past additional production request data
6
End

FIG. 10A



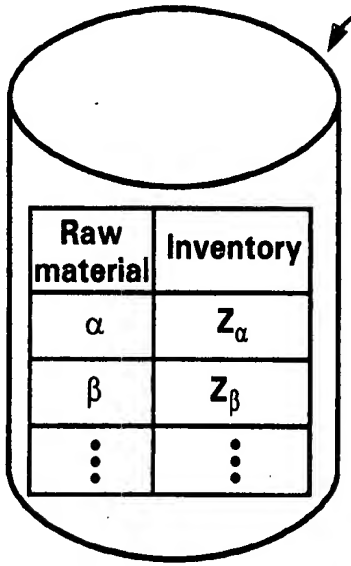
Product-classified raw material constitution data table

FIG. 10B



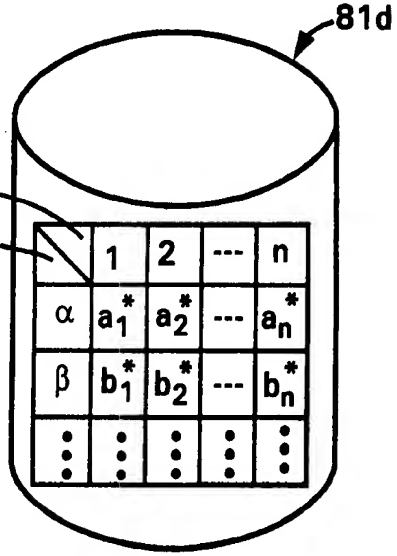
Raw material-classified required quantity data table

FIG. 10C



Raw material- classified inventory data table

FIG. 10D



Raw material-classified acceptance schedule data table

FIG.11

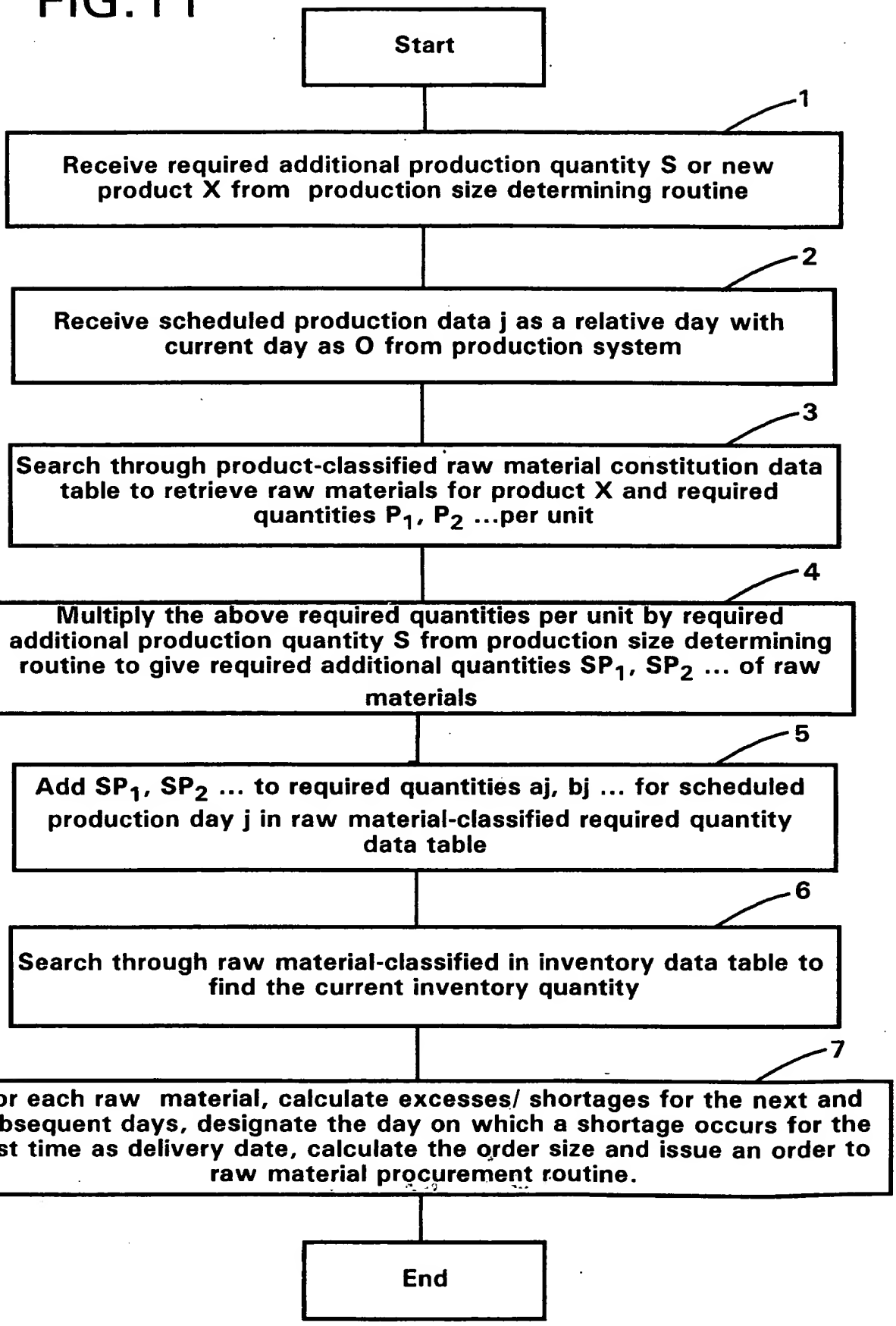

Start
1
Receive required additional production quantity S or new product X from production size determining routine
2
Receive scheduled production data j as a relative day with current day as O from production system
3
Search through product-classified raw material constitution data table to retrieve raw materials for product X and required quantities P_1, P_2 ...per unit
4
Multiply the above required quantities per unit by required additional production quantity S from production size determining routine to give required additional quantities SP_1, SP_2 ... of raw materials
5
Add SP_1, SP_2 ... to required quantities aj, bj ... for scheduled production day j in raw material-classified required quantity data table
6
Search through raw material-classified in inventory data table to find the current inventory quantity
7
For each raw material, calculate excesses/ shortages for the next and subsequent days, designate the day on which a shortage occurs for the first time as delivery date, calculate the order size and issue an order to raw material procurement routine.
End

FIG.12

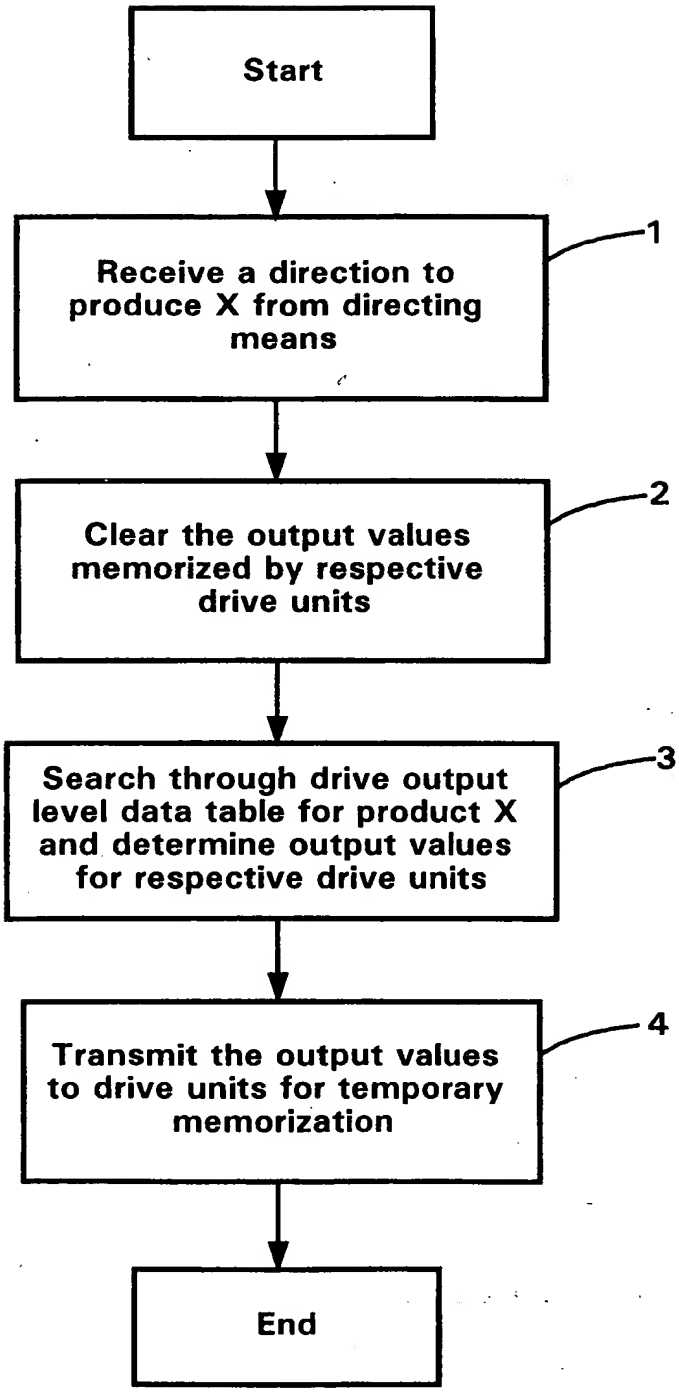
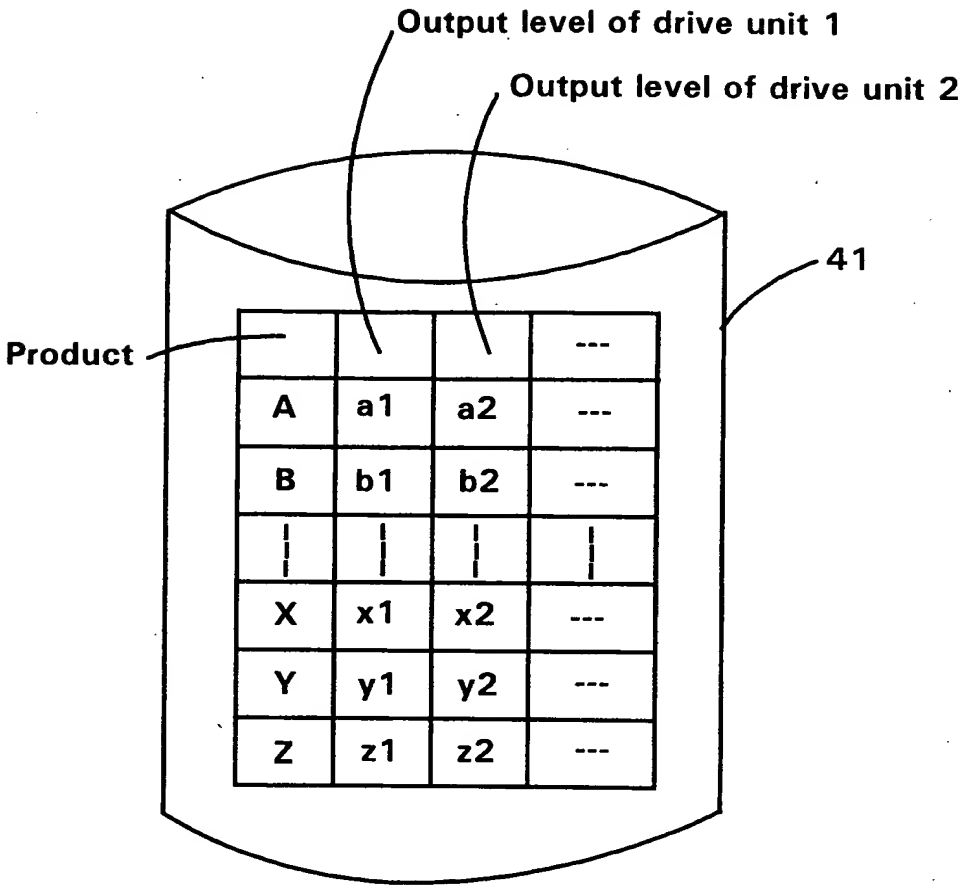

Start
Receive a direction to produce X from directing means
1
Clear the output values memorized by respective drive units
2
Search through drive output level data table for product X and determine output values for respective drive units
3
Transmit the output values to drive units for temporary memorization
4
End

FIG.13



Drive output level data table

FIG.14

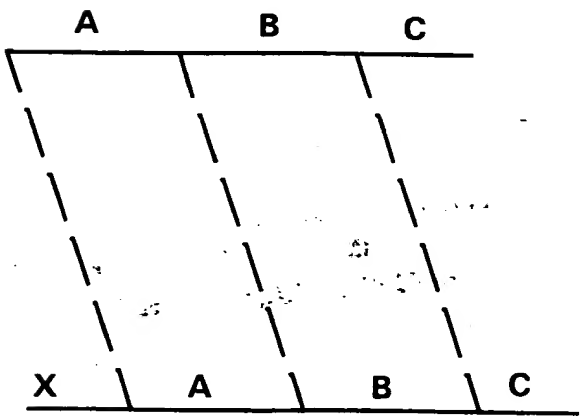


FIG. 15

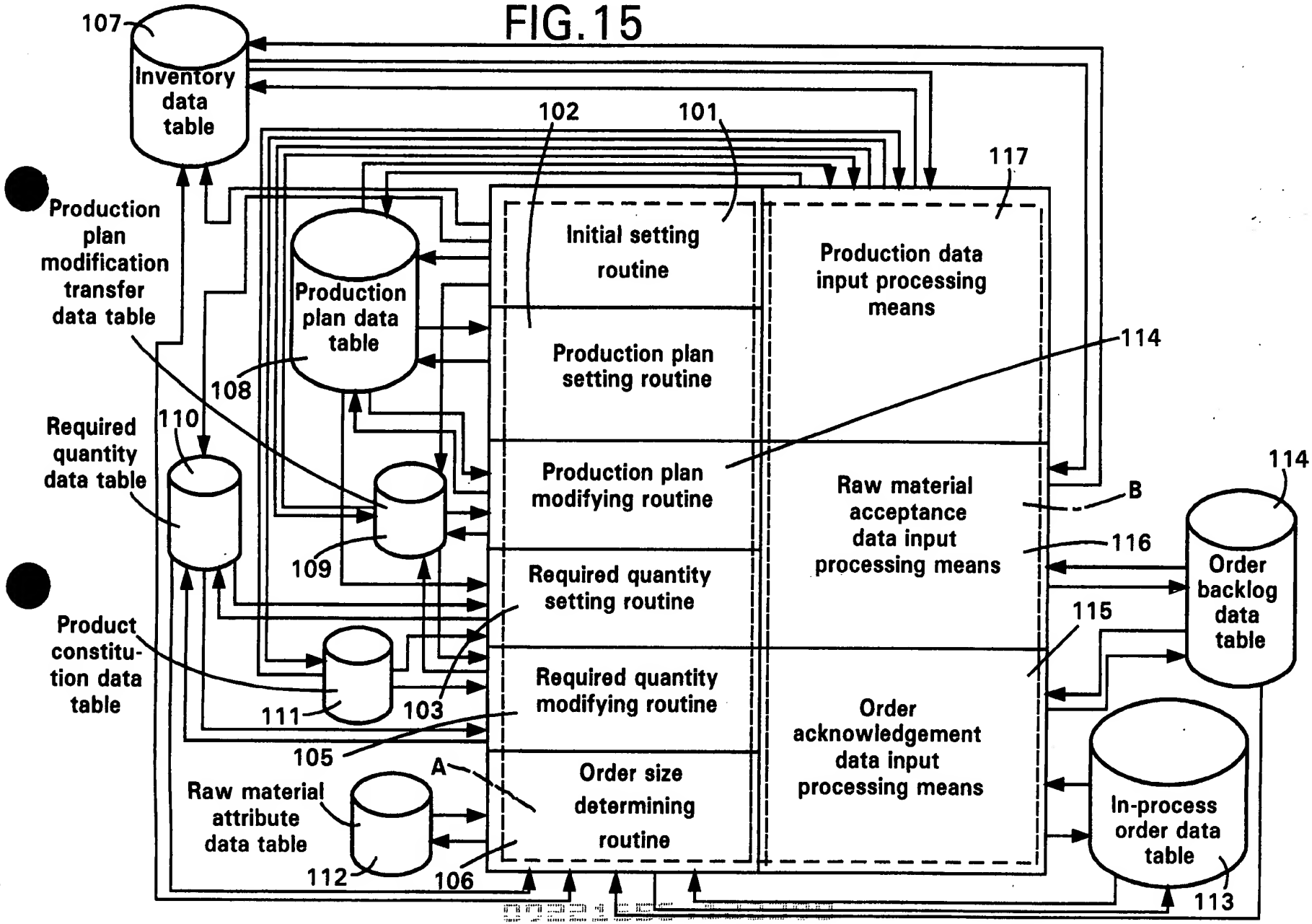
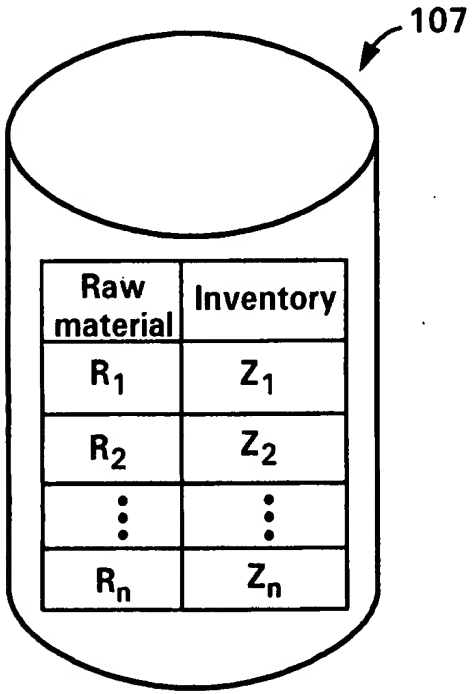
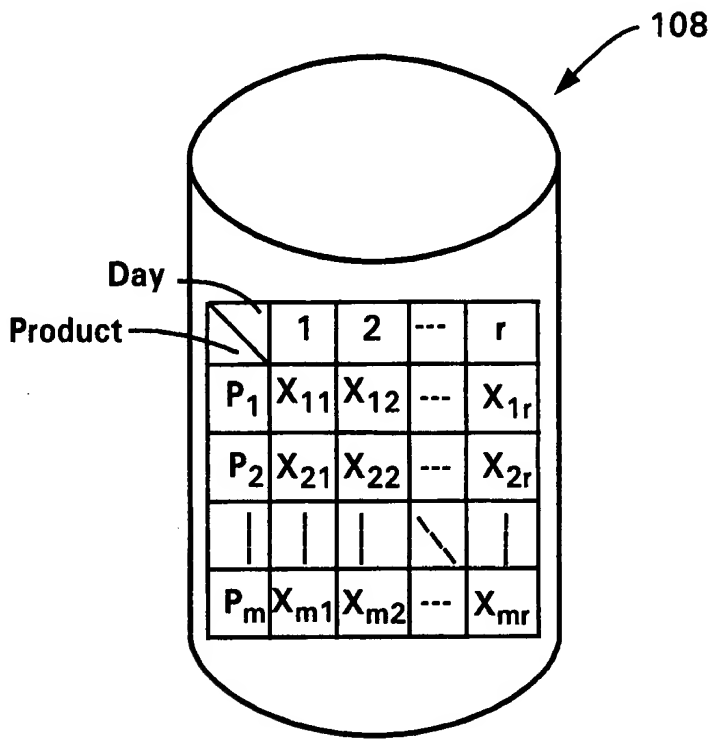

107
Inventory data table
102
101
117
Production plan modification transfer data table
Production plan data table
Initial setting routine
Production data input processing means
Production plan setting routine
114
108
110
Required quantity data table
Production plan modifying routine
Raw material acceptance data input processing means
B
114
116
Order backlog data table
109
Required quantity setting routine
115
Product constitution data table
111
103
Required quantity modifying routine
Order acknowledgement data input processing means
105
A
Raw material attribute data table
Order size determining routine
In-process order data table
112
106
113

FIG.16



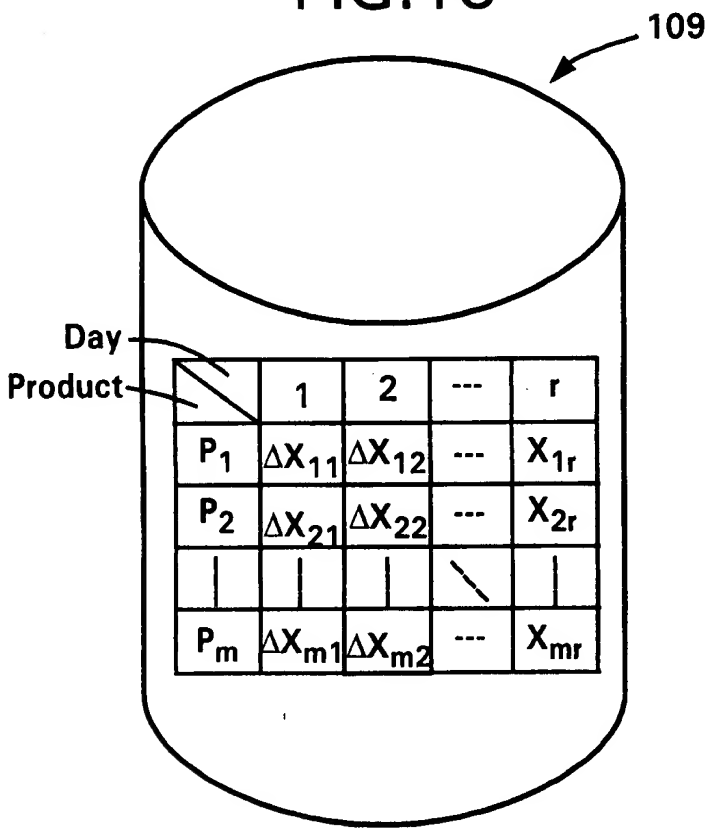
Inventory data table

FIG.17



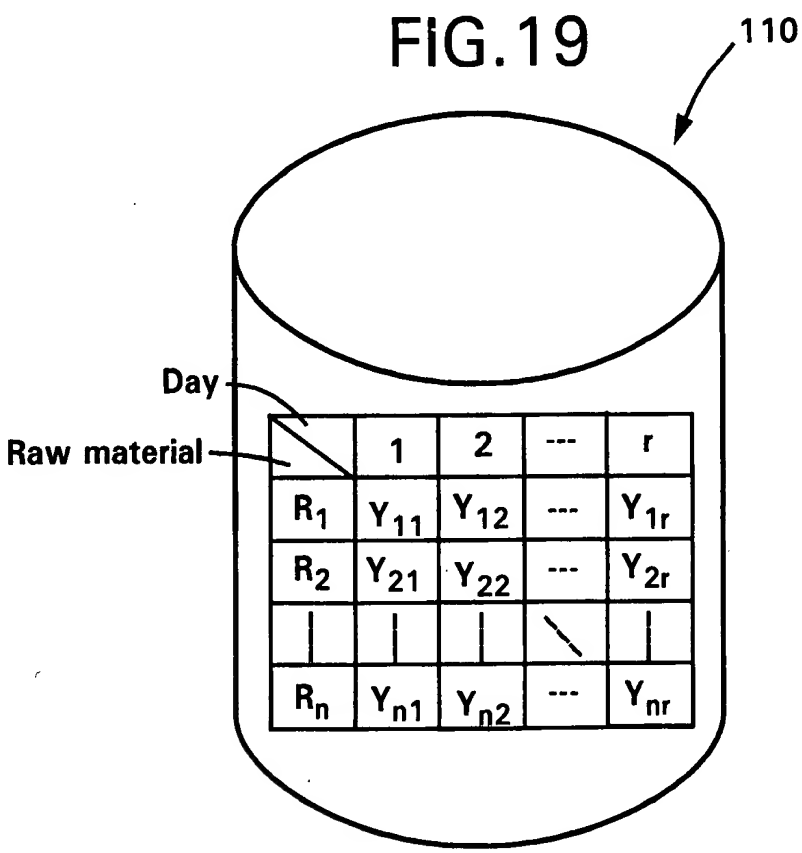
Production plan data table

FIG.18



Production plan modification transfer data table

FIG.19



Required quantity data table

FIG.20

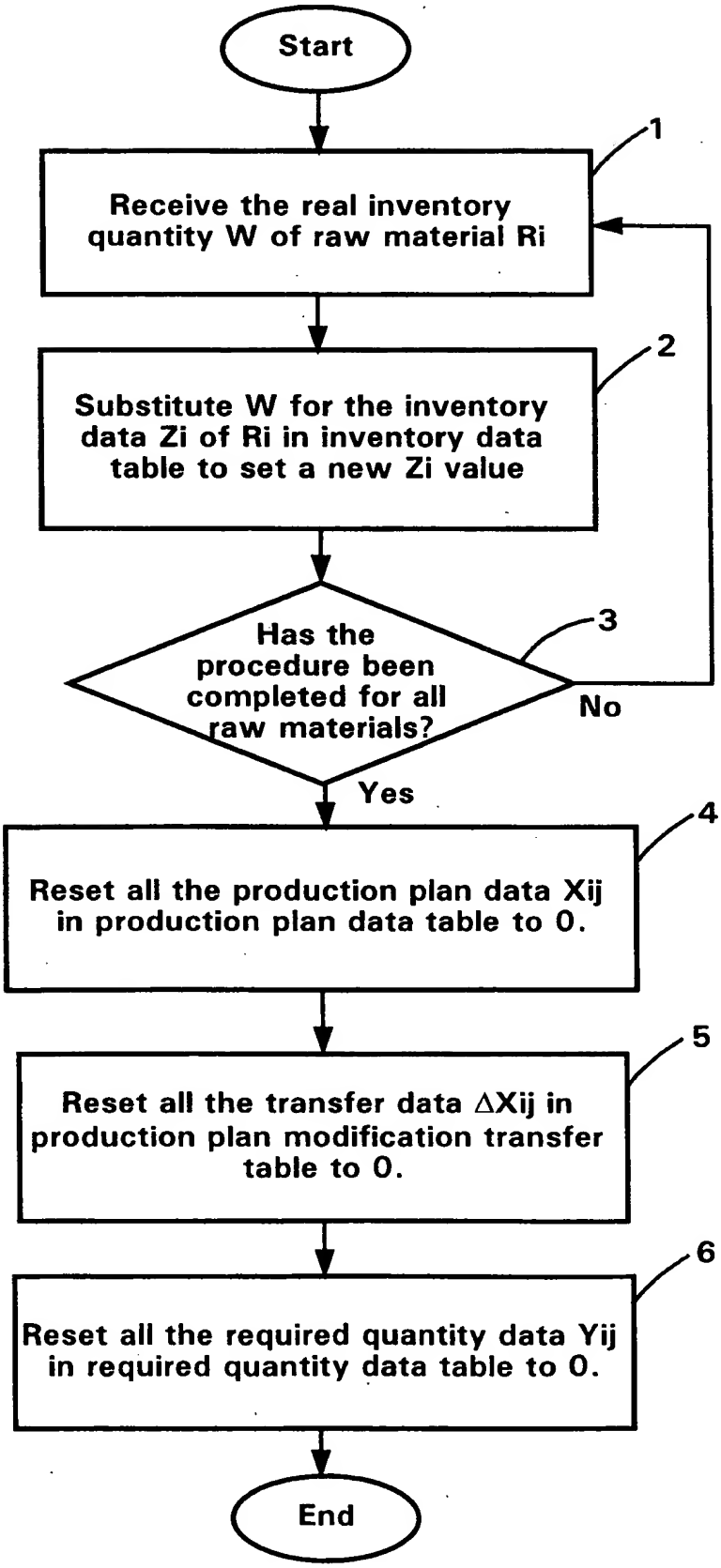

Start
1
Receive the real inventory quantity W of raw material Ri
2
Substitute W for the inventory data Zi of Ri in inventory data table to set a new Zi value
3
Has the procedure been completed for all raw materials?
No
Yes
4
Reset all the production plan data Xij in production plan data table to 0.
5
Reset all the transfer data ΔXij in production plan modification transfer table to 0.
6
Reset all the required quantity data Yij in required quantity data table to 0.
End

FIG.21

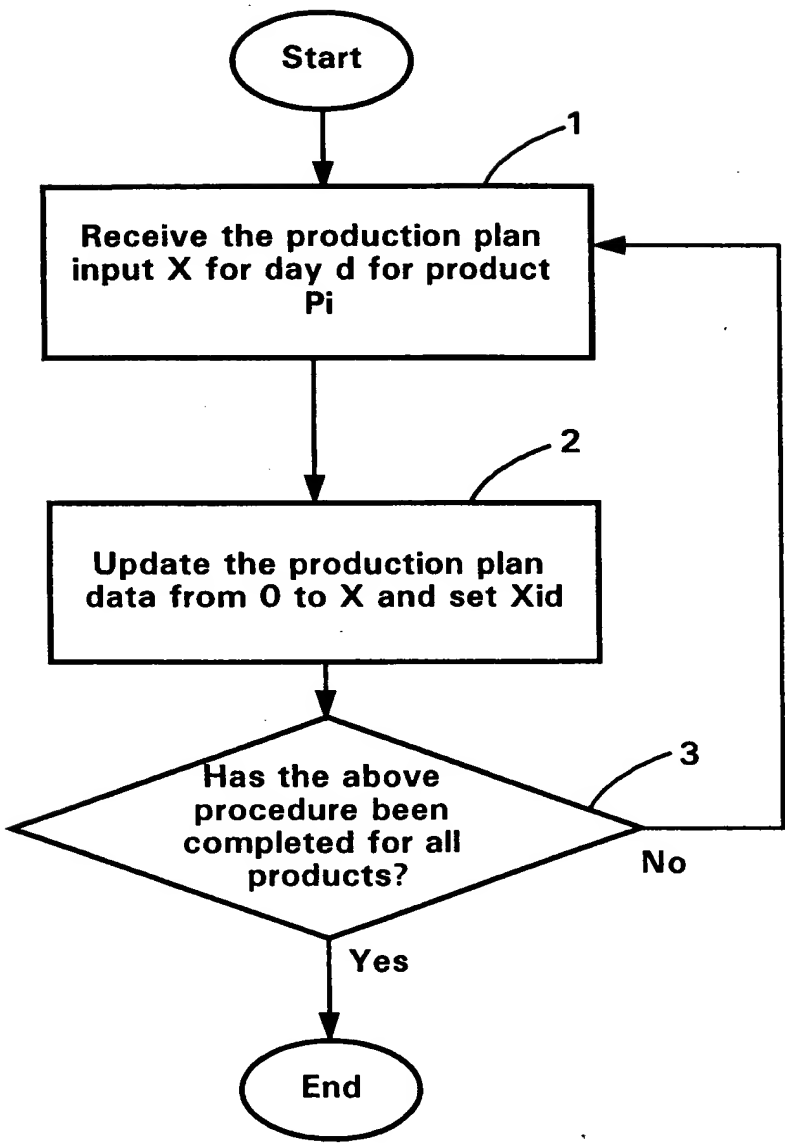

Start
1
Receive the production plan input X for day d for product Pi
2
Update the production plan data from 0 to X and set Xid
3
Has the above procedure been completed for all products?
No
Yes
End

FIG.22

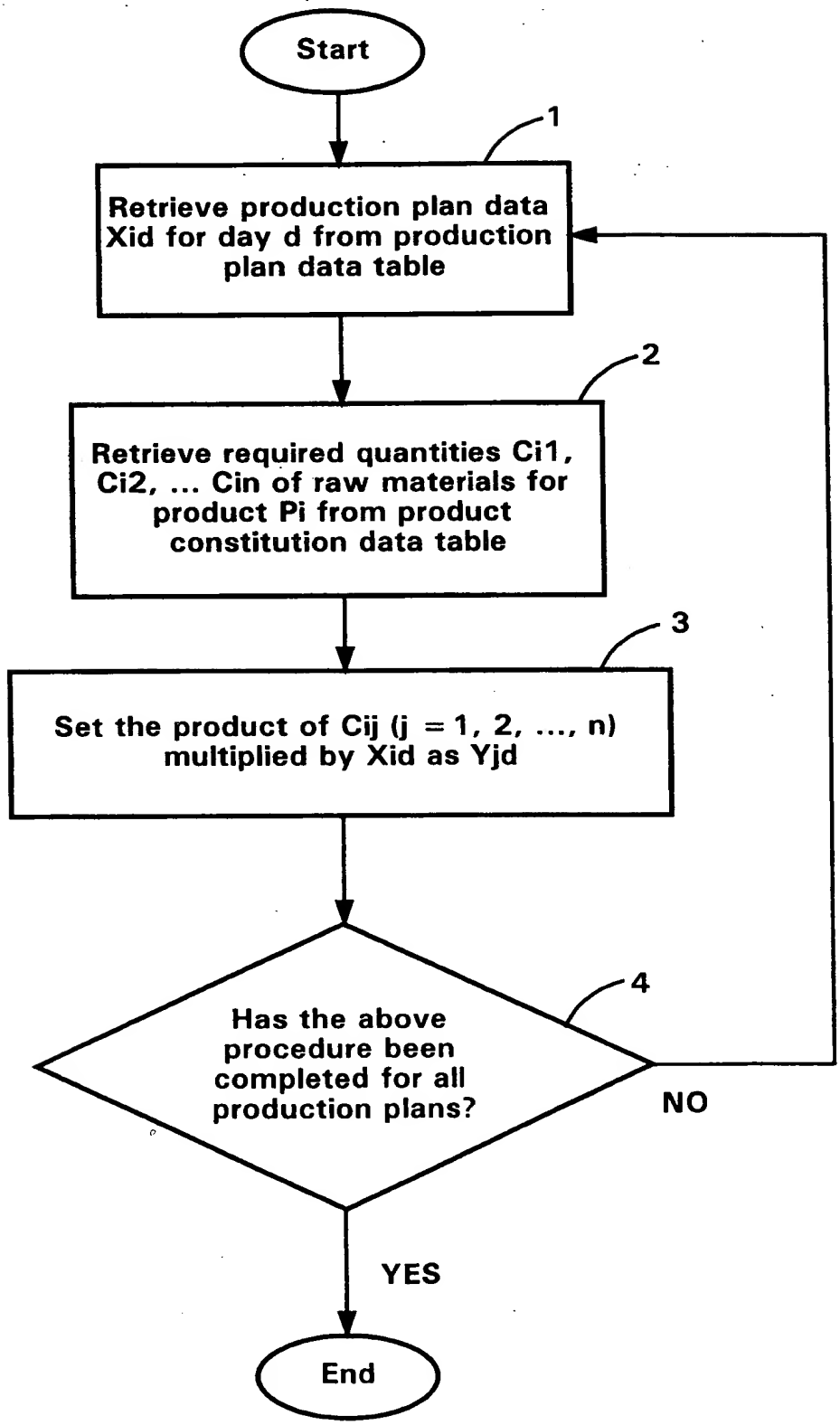
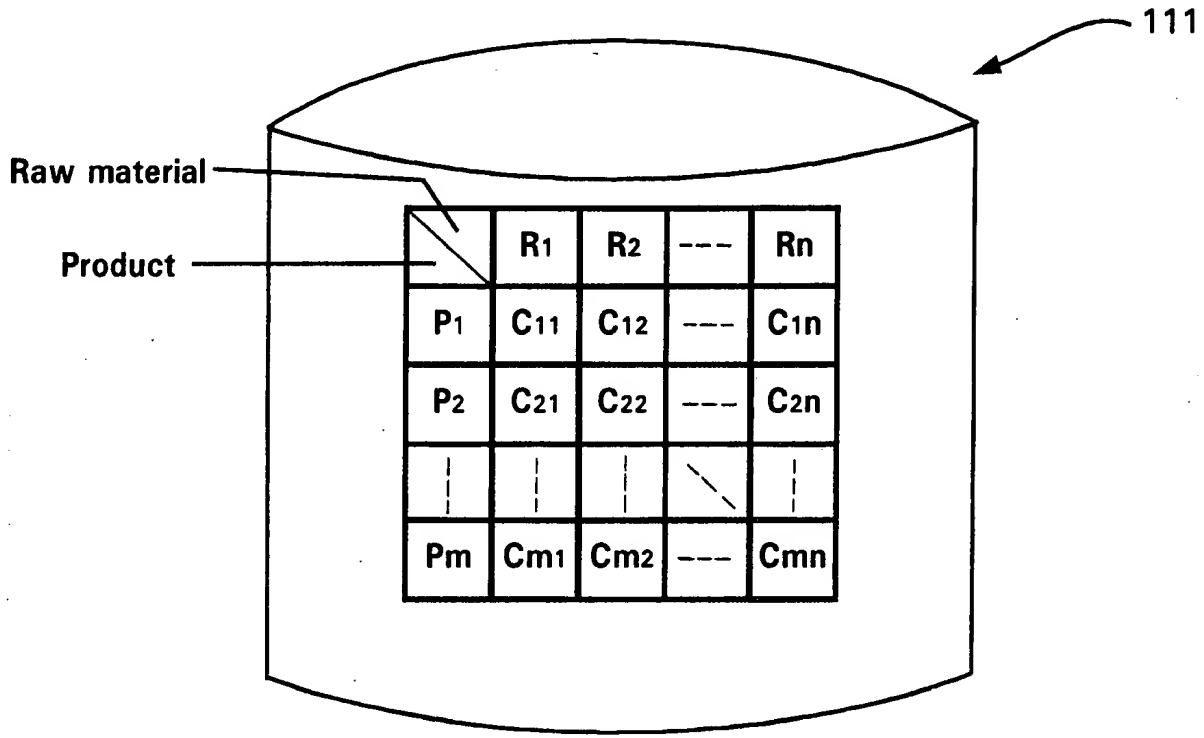

Start
1
Retrieve production plan data Xid for day d from production plan data table
2
Retrieve required quantities Ci1, Ci2, ... Cin of raw materials for product Pi from product constitution data table
3
Set the product of Cij (j = 1, 2, ..., n) multiplied by Xid as Yjd
4
Has the above procedure been completed for all production plans?
NO
YES
End

FIG.23



Product constitution data table

FIG.24

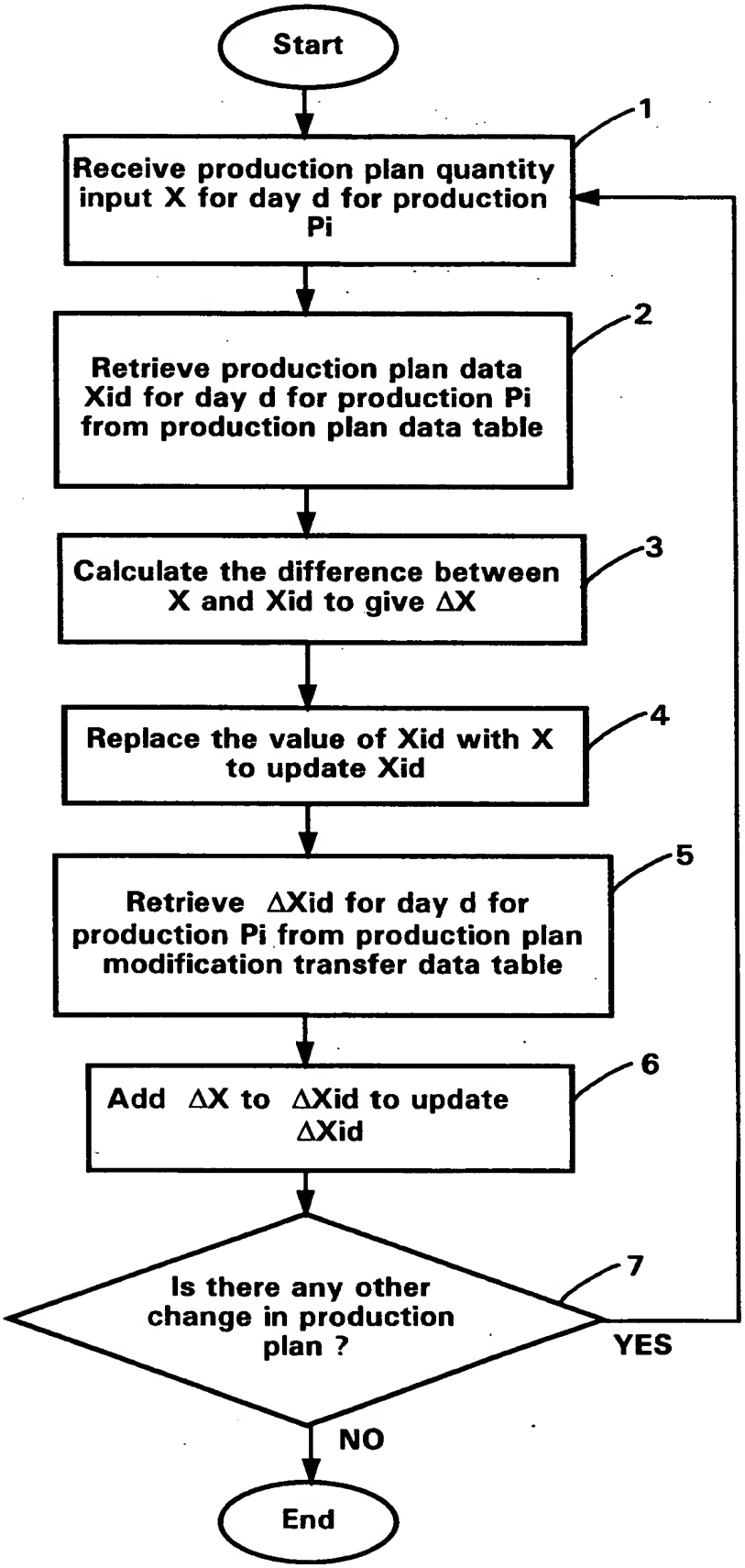

Start
1
Receive production plan quantity input X for day d for production Pi
2
Retrieve production plan data Xid for day d for production Pi from production plan data table
3
Calculate the difference between X and Xid to give ΔX
4
Replace the value of Xid with X to update Xid
5
Retrieve ΔXid for day d for production Pi from production plan modification transfer data table
6
Add ΔX to ΔXid to update ΔXid
7
Is there any other change in production plan ?
YES
NO
End

FIG.25

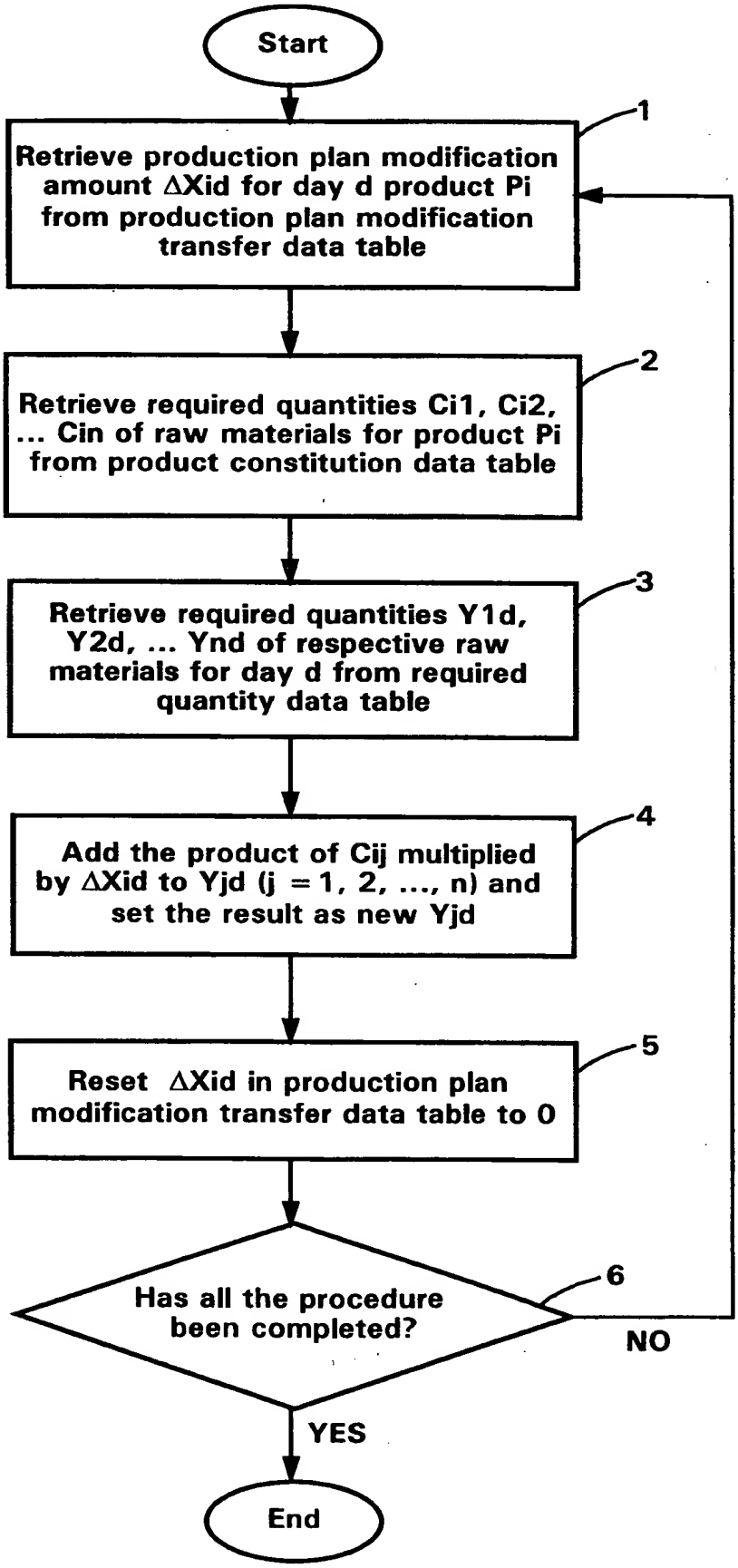

Start
1
Retrieve production plan modification amount ΔXid for day d product Pi from production plan modification transfer data table
2
Retrieve required quantities Ci1, Ci2, ... Cin of raw materials for product Pi from product constitution data table
3
Retrieve required quantities Y1d, Y2d, ... Ynd of respective raw materials for day d from required quantity data table
4
Add the product of Cij multiplied by ΔXid to Yjd (j = 1, 2, ..., n) and set the result as new Yjd
5
Reset ΔXid in production plan modification transfer data table to 0
6
Has all the procedure been completed?
NO
YES
End

FIG.26A

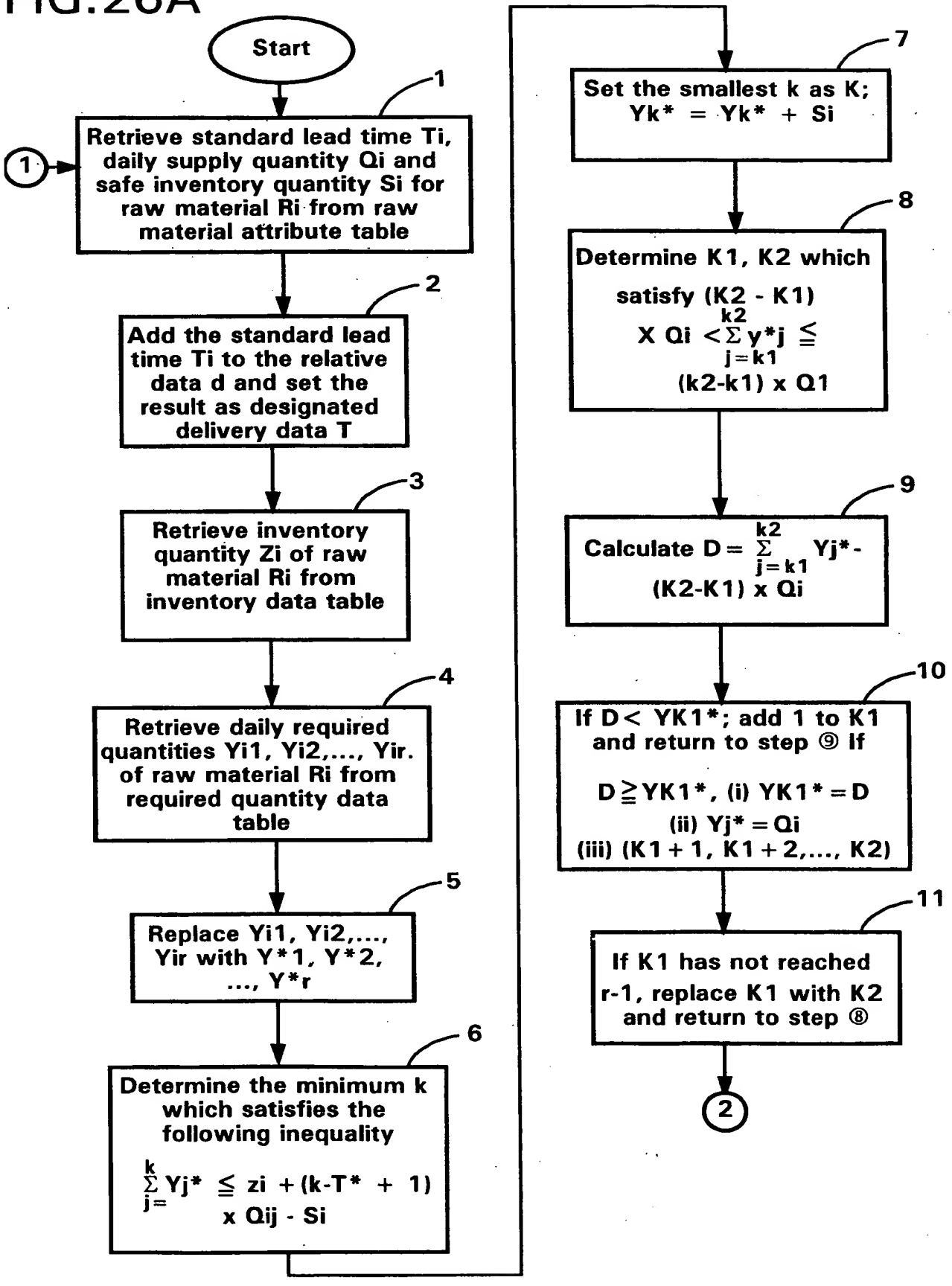

Start
1
Retrieve standard lead time Ti, daily supply quantity Qi and safe inventory quantity Si for raw material Ri from raw material attribute table
2
Add the standard lead time Ti to the relative data d and set the result as designated delivery data T
3
Retrieve inventory quantity Zi of raw material Ri from inventory data table
4
Retrieve daily required quantities Yi1, Yi2,..., Yir. of raw material Ri from required quantity data table
5
Replace Yi1, Yi2,..., Yir with Y*1, Y*2, ..., Y*r
6
Determine the minimum k which satisfies the following inequality
$\sum_{j=}^{k} Yj^* \leqq zi + (k-T^* + 1) \times Qij - Si$
7
Set the smallest k as K; Yk* = Yk* + Si
8
Determine K1, K2 which satisfy (K2 - K1) X Qi $< \sum_{j=k1}^{k2} y^*j \leqq$ (k2-k1) x Q1
9
Calculate D = $\sum_{j=k1}^{k2} Yj^*$ - (K2-K1) x Qi
10
If D < YK1*; add 1 to K1 and return to step ⑨ If D ≧ YK1*, (i) YK1* = D (ii) Yj* = Qi (iii) (K1 + 1, K1 + 2,..., K2)
11
If K1 has not reached r-1, replace K1 with K2 and return to step ⑧
1
2

FIG.26B

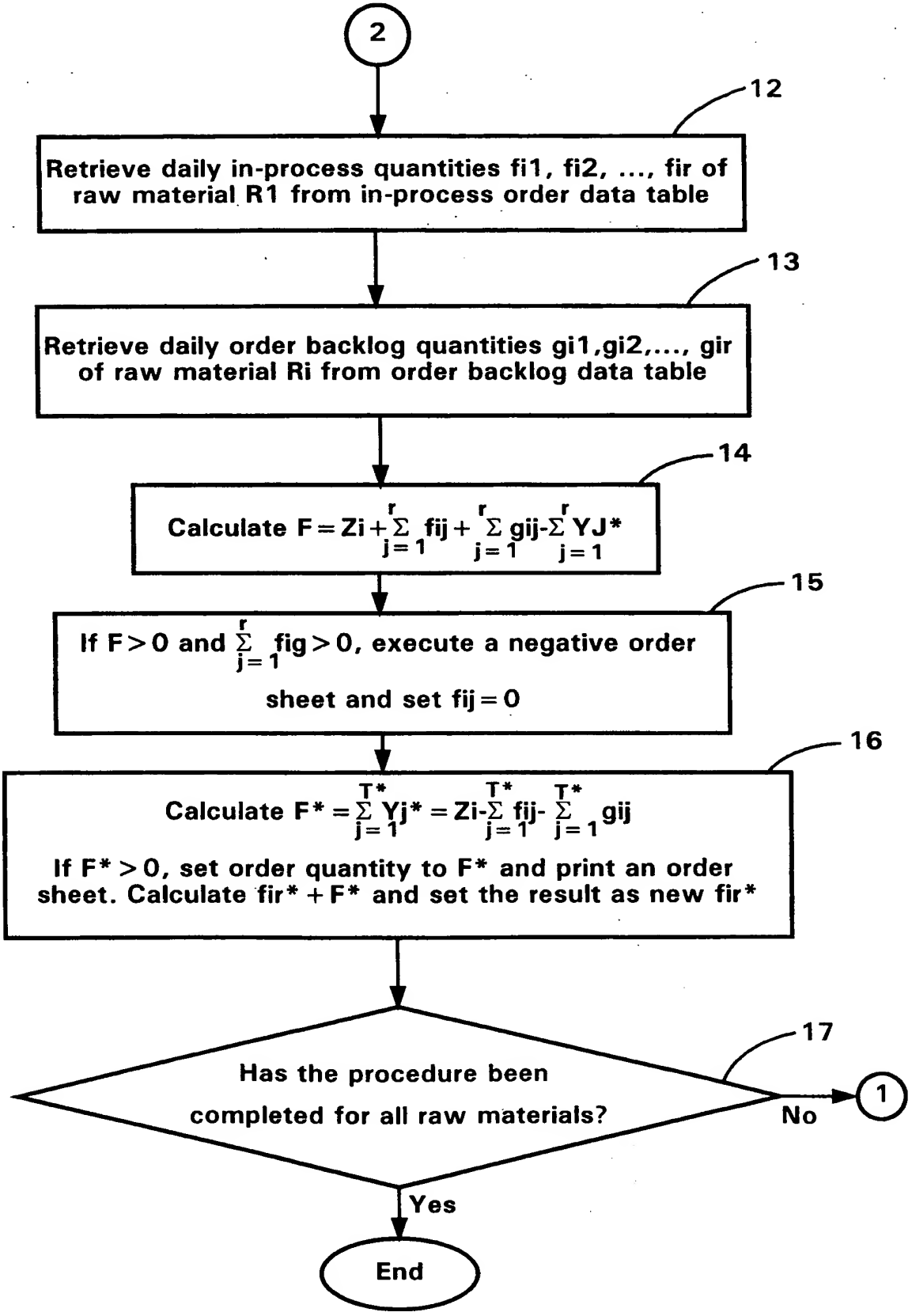
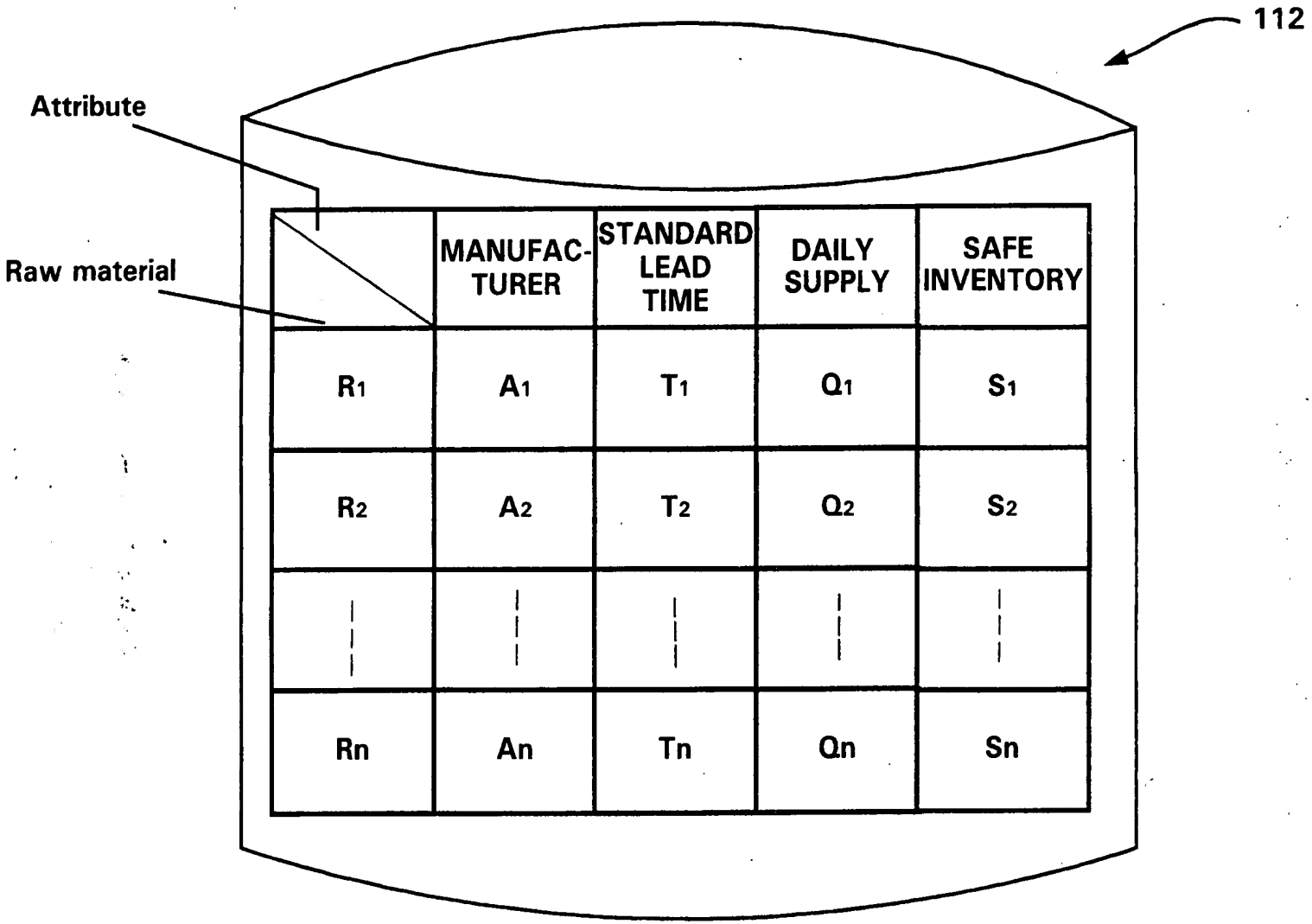
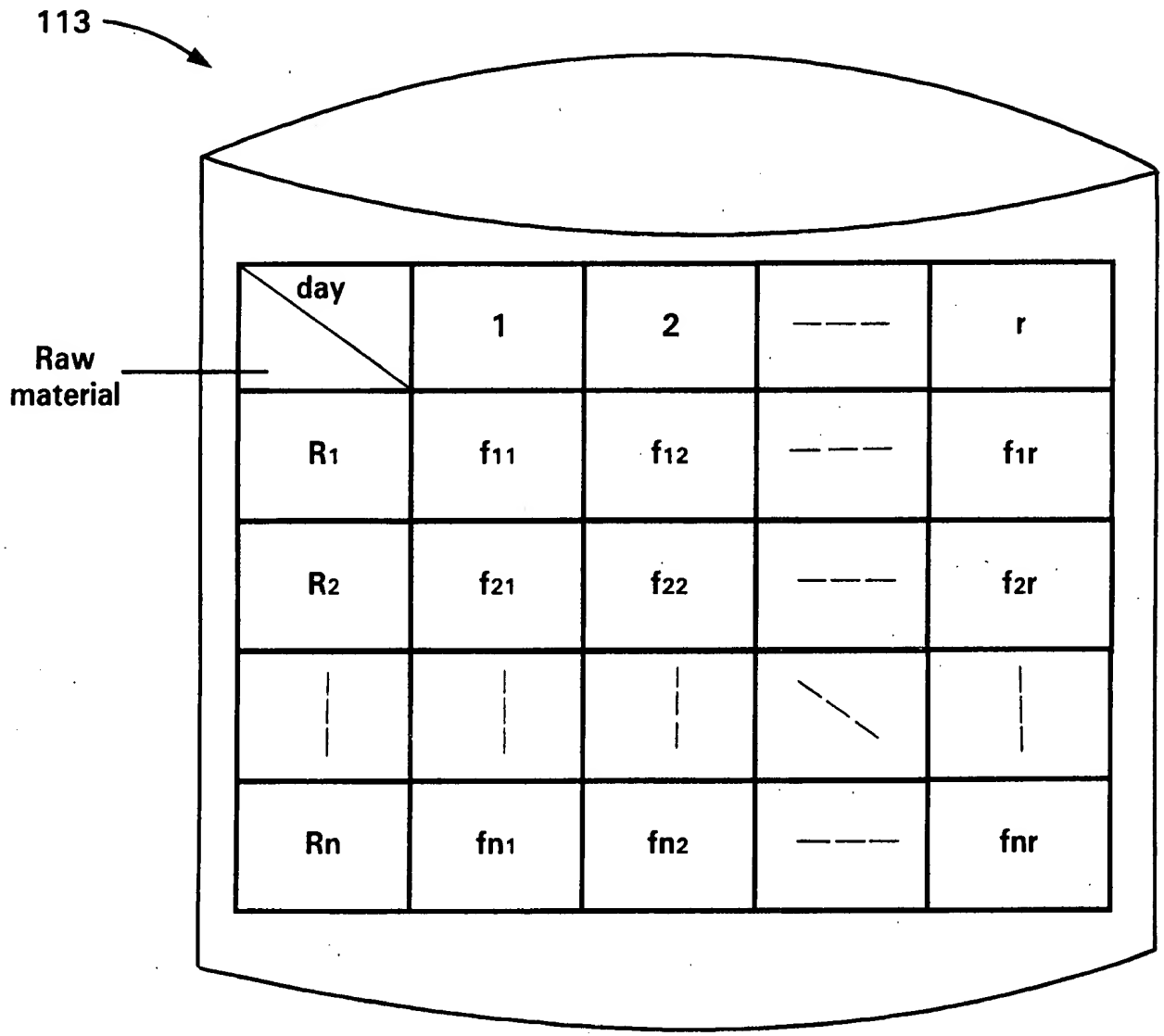

2
12
Retrieve daily in-process quantities fi1, fi2, ..., fir of raw material R1 from in-process order data table
13
Retrieve daily order backlog quantities gi1,gi2,..., gir of raw material Ri from order backlog data table
14
Calculate $F = Zi + \sum_{j=1}^{r} fij + \sum_{j=1}^{r} gij - \sum_{j=1}^{r} YJ^*$
15
If $F > 0$ and $\sum_{j=1}^{r} fig > 0$, execute a negative order sheet and set $fij = 0$
16
Calculate $F^* = \sum_{j=1}^{T^*} Yj^* = Zi - \sum_{j=1}^{T^*} fij - \sum_{j=1}^{T^*} gij$
If $F^* > 0$, set order quantity to F^* and print an order sheet. Calculate $fir^* + F^*$ and set the result as new fir^*
17
Has the procedure been completed for all raw materials?
No
1
Yes
End

FIG.27



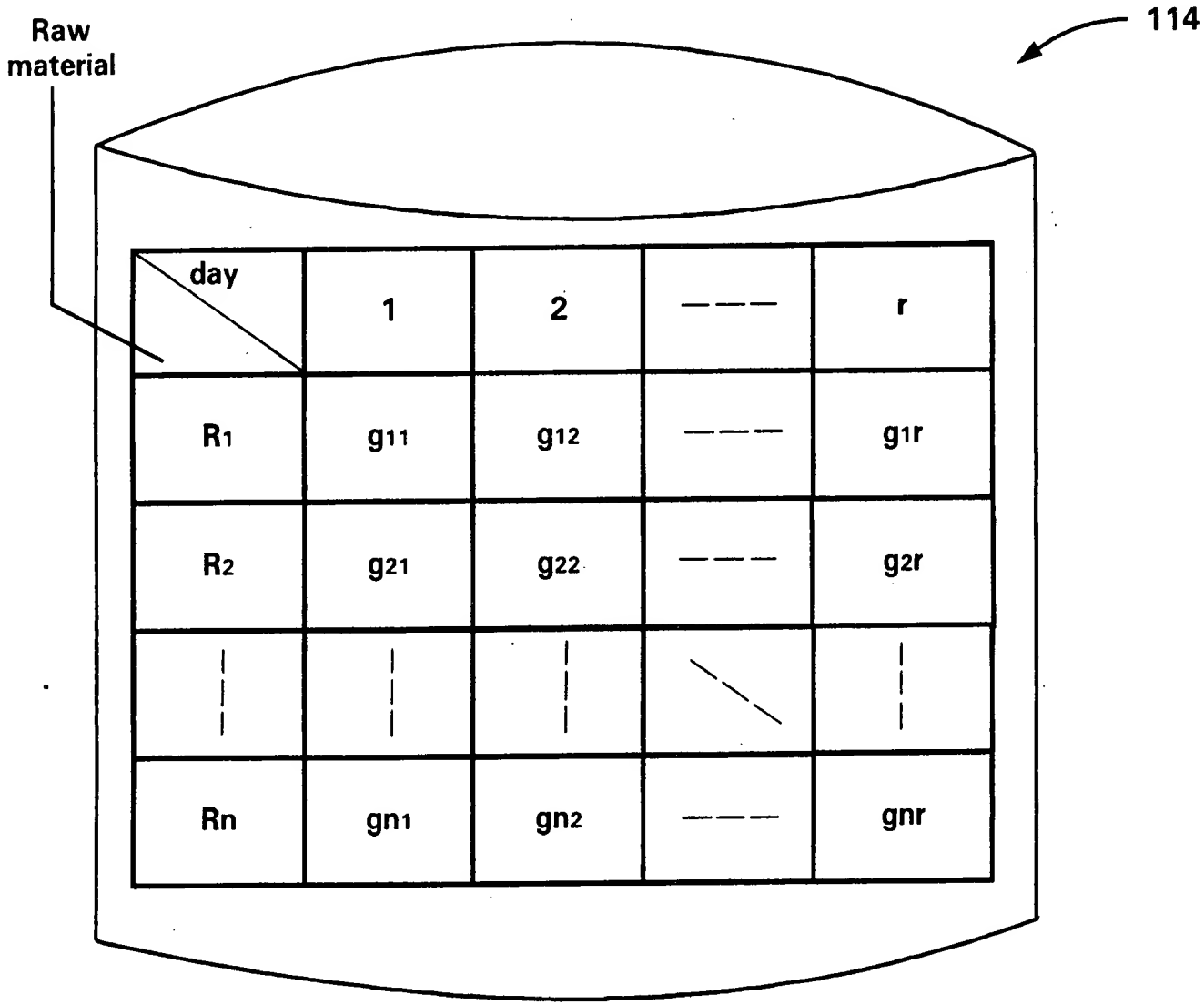
Raw material attribute data table

FIG.28



In - process order data table

FIG.29



Order backlog data table

FIG.30

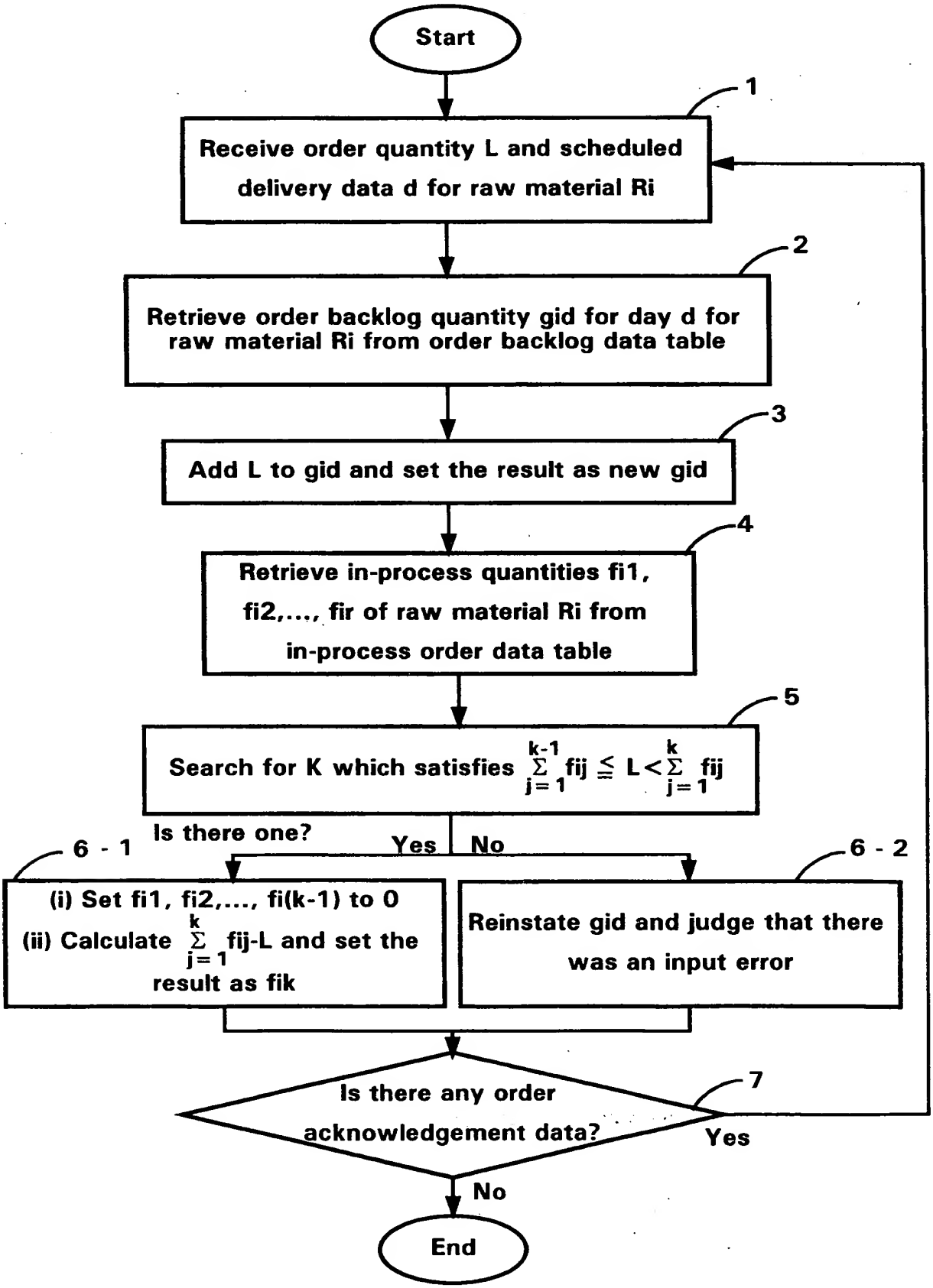

Start
1
Receive order quantity L and scheduled delivery data d for raw material Ri
2
Retrieve order backlog quantity gid for day d for raw material Ri from order backlog data table
3
Add L to gid and set the result as new gid
4
Retrieve in-process quantities fi1, fi2,..., fir of raw material Ri from in-process order data table
5
Search for K which satisfies $\sum_{j=1}^{k-1} fij \leqq L < \sum_{j=1}^{k} fij$
Is there one?
Yes
No
6 - 1
(i) Set fi1, fi2,..., fi(k-1) to 0
(ii) Calculate $\sum_{j=1}^{k} fij - L$ and set the result as fik
6 - 2
Reinstate gid and judge that there was an input error
7
Is there any order acknowledgement data?
Yes
No
End

FIG.31

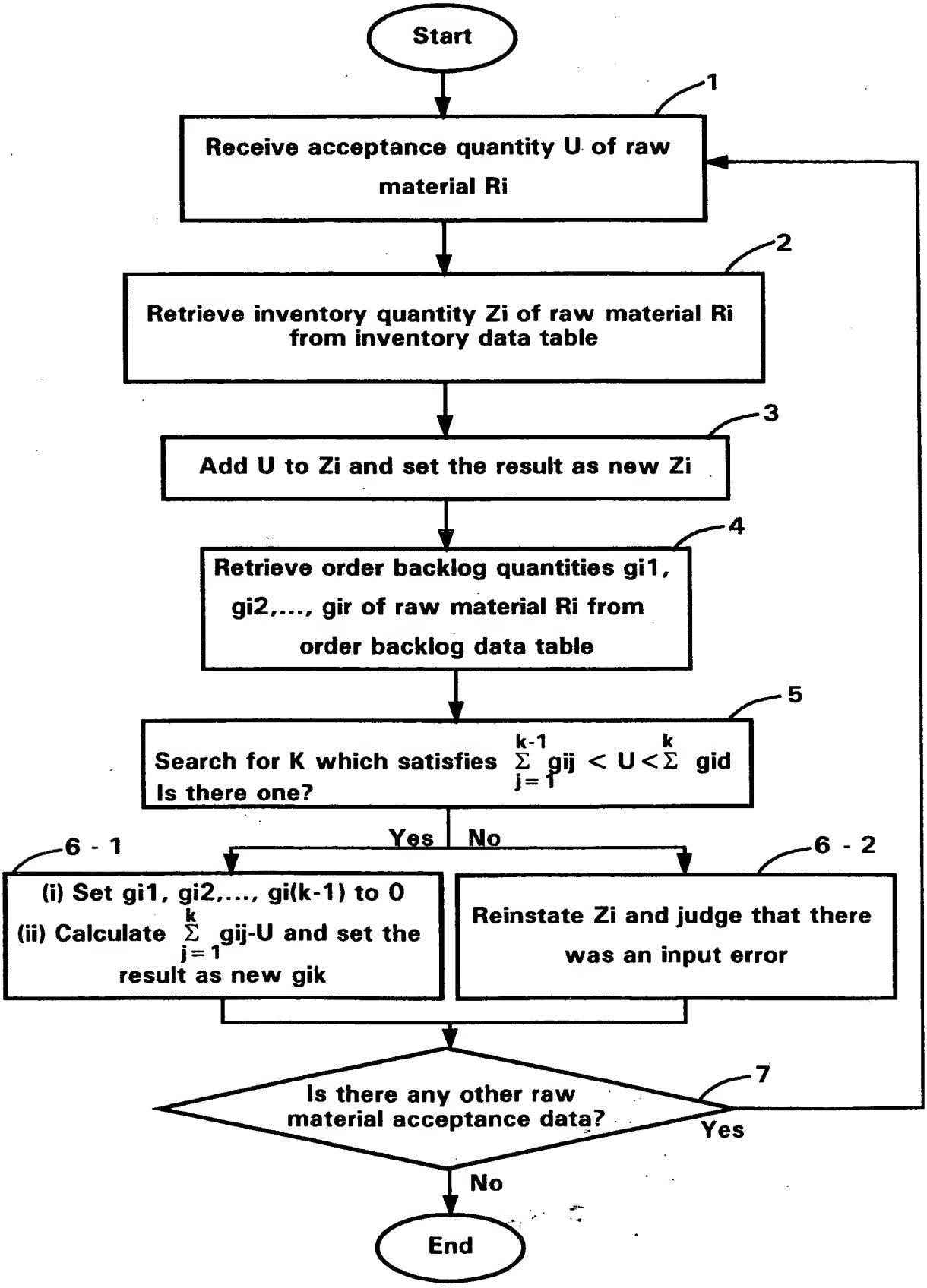

Start
1
Receive acceptance quantity U of raw material Ri
2
Retrieve inventory quantity Zi of raw material Ri from inventory data table
3
Add U to Zi and set the result as new Zi
4
Retrieve order backlog quantities gi1, gi2,..., gir of raw material Ri from order backlog data table
5
Search for K which satisfies $\sum_{j=1}^{k-1} gij < U < \sum_{j=1}^{k} gid$ Is there one?
Yes
No
6 - 1
(i) Set gi1, gi2,..., gi(k-1) to 0
(ii) Calculate $\sum_{j=1}^{k} gij - U$ and set the result as new gik
6 - 2
Reinstate Zi and judge that there was an input error
7
Is there any other raw material acceptance data?
Yes
No
End

FIG.32

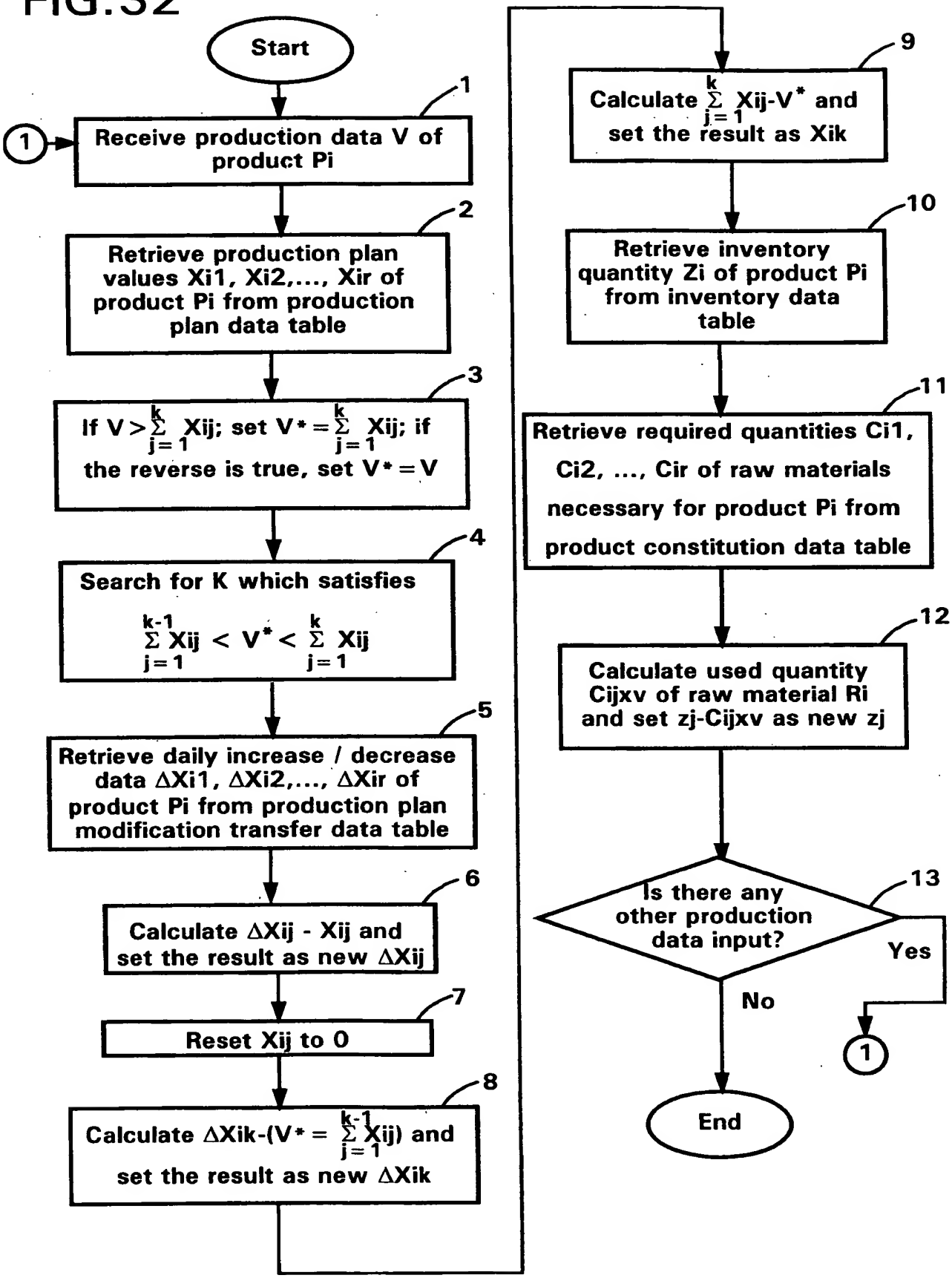

Start
1
Receive production data V of product Pi
2
Retrieve production plan values Xi1, Xi2,..., Xir of product Pi from production plan data table
3
If $V > \sum_{j=1}^{k} Xij$; set $V^* = \sum_{j=1}^{k} Xij$; if the reverse is true, set $V^* = V$
4
Search for K which satisfies $\sum_{j=1}^{k-1} Xij < V^* < \sum_{j=1}^{k} Xij$
5
Retrieve daily increase / decrease data ΔXi1, ΔXi2,..., ΔXir of product Pi from production plan modification transfer data table
6
Calculate ΔXij - Xij and set the result as new ΔXij
7
Reset Xij to 0
8
Calculate $\Delta Xik-(V^* = \sum_{j=1}^{k-1} Xij)$ and set the result as new ΔXik
9
Calculate $\sum_{j=1}^{k} Xij-V^*$ and set the result as Xik
10
Retrieve inventory quantity Zi of product Pi from inventory data table
11
Retrieve required quantities Ci1, Ci2, ..., Cir of raw materials necessary for product Pi from product constitution data table
12
Calculate used quantity Cijxv of raw material Ri and set zj-Cijxv as new zj
13
Is there any other production data input?
Yes
No
1
End

FIG.33

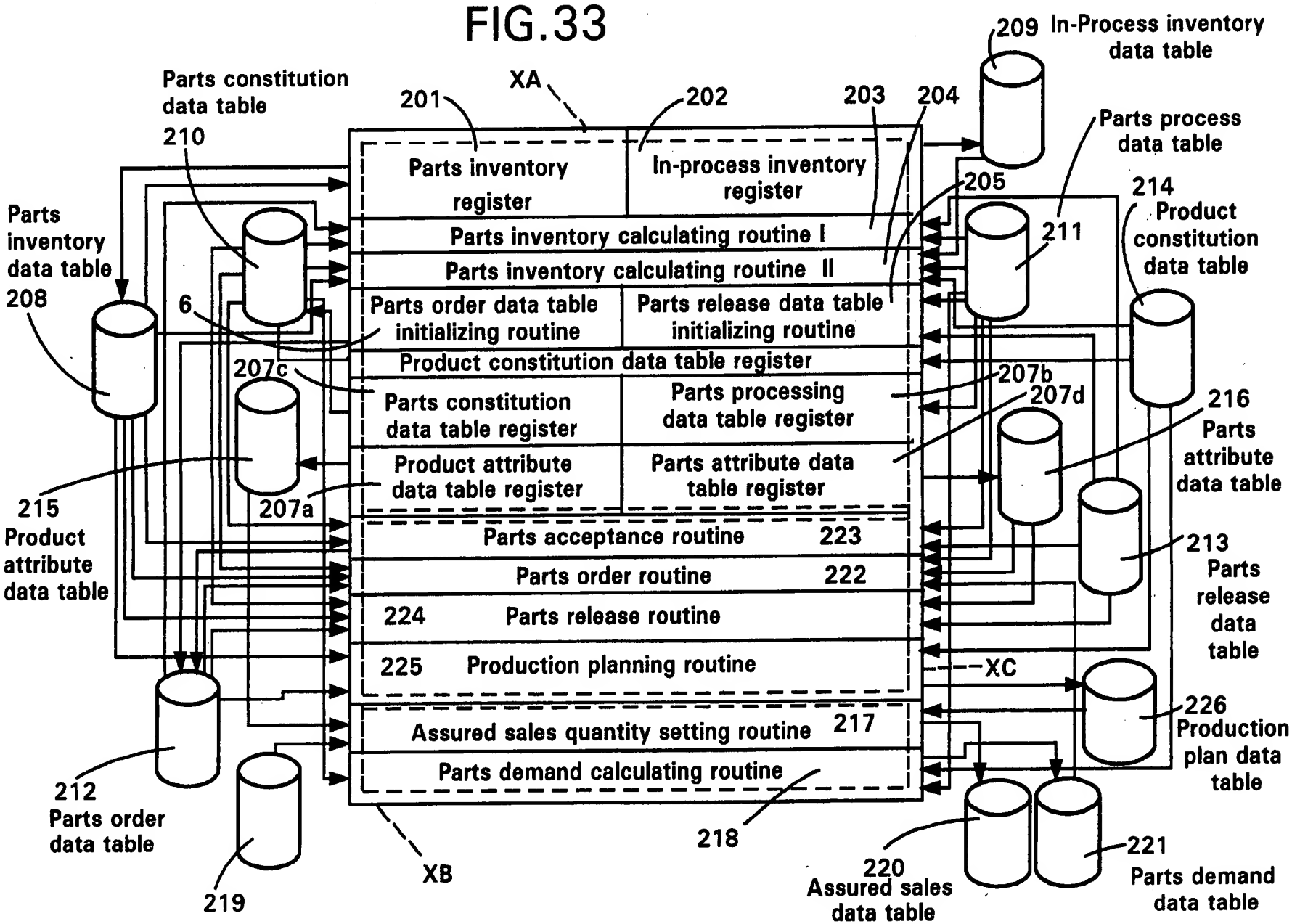
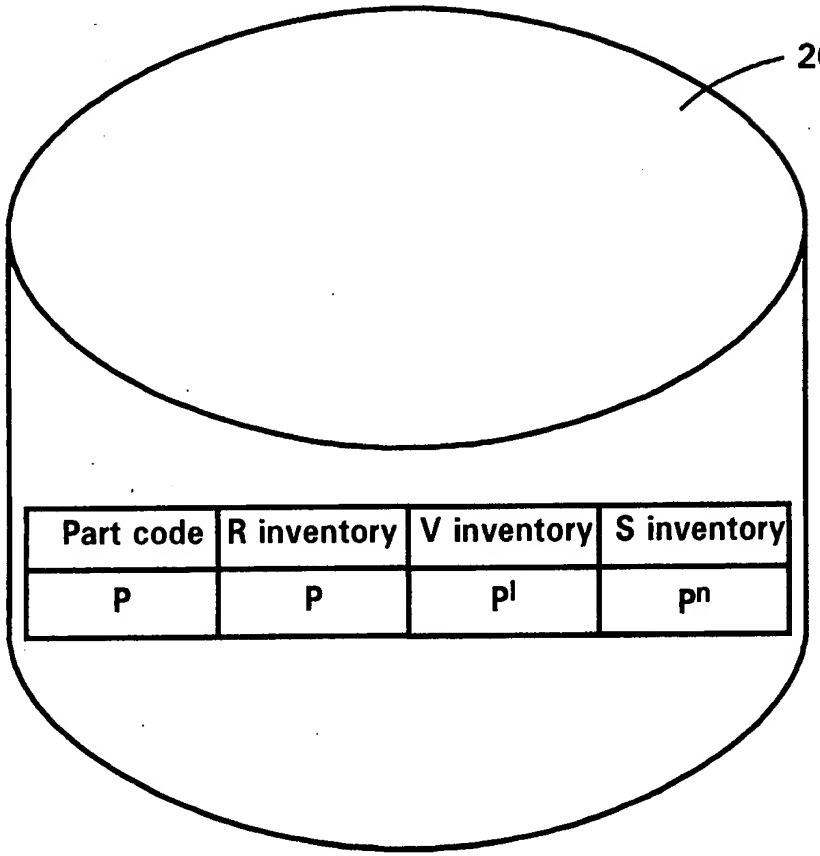
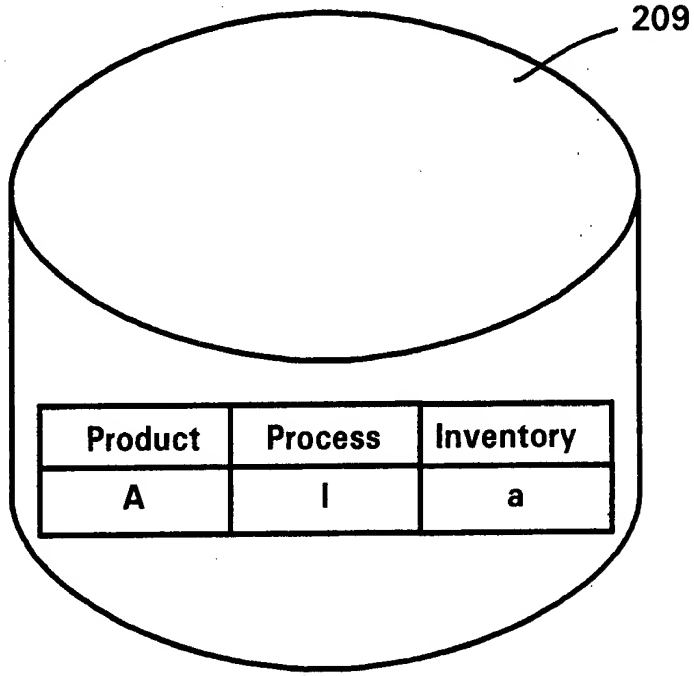

209 In-Process inventory data table
Parts constitution data table
210
XA
201
202
203
204
Parts process data table
Parts inventory register
In-process inventory register
205
214 Product constitution data table
Parts inventory data table
208
Parts inventory calculating routine I
211
Parts inventory calculating routine II
6
Parts order data table initializing routine
Parts release data table initializing routine
Product constitution data table register
207c
207b
Parts constitution data table register
Parts processing data table register
207d
216 Parts attribute data table
215 Product attribute data table
Product attribute data table register
Parts attribute data table register
207a
Parts acceptance routine 223
Parts order routine 222
213 Parts release data table
224 Parts release routine
225 Production planning routine
XC
226 Production plan data table
Assured sales quantity setting routine 217
Parts demand calculating routine
212 Parts order data table
218
XB
220 Assured sales data table
221 Parts demand data table
219

FIG.34



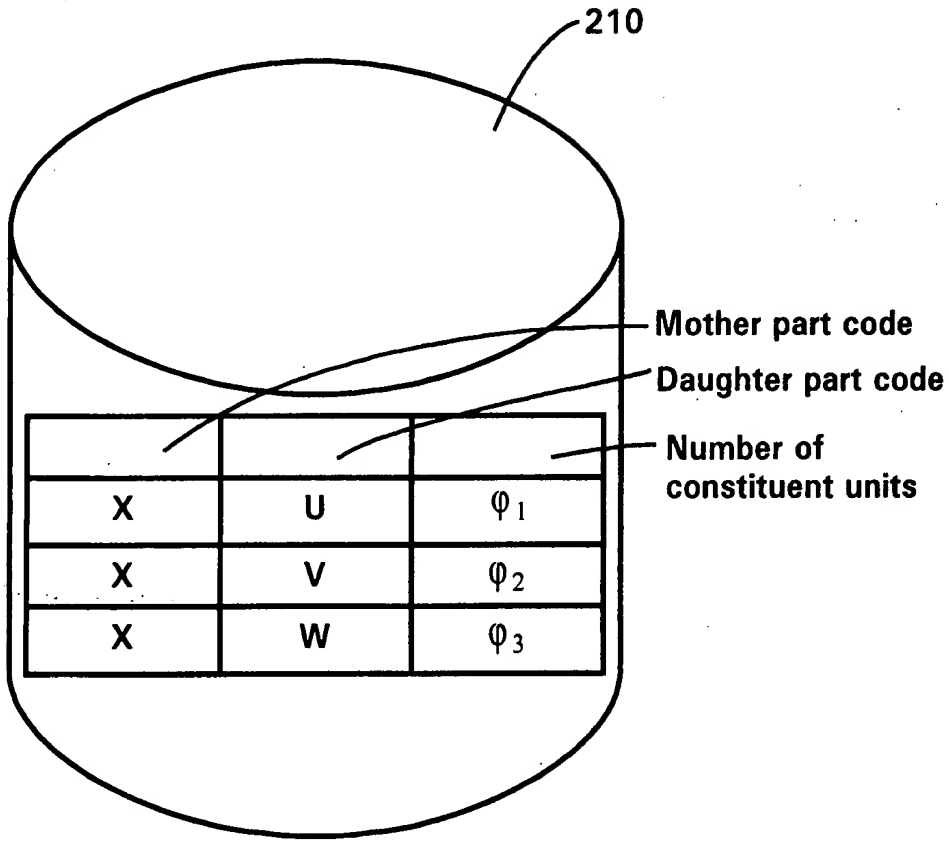
Parts inventory data table

FIG.35



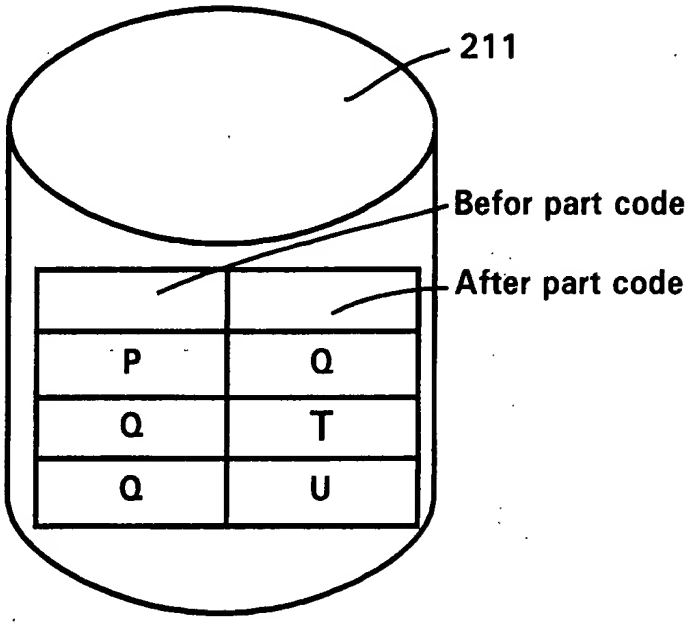
In-process inventory data table

FIG.36



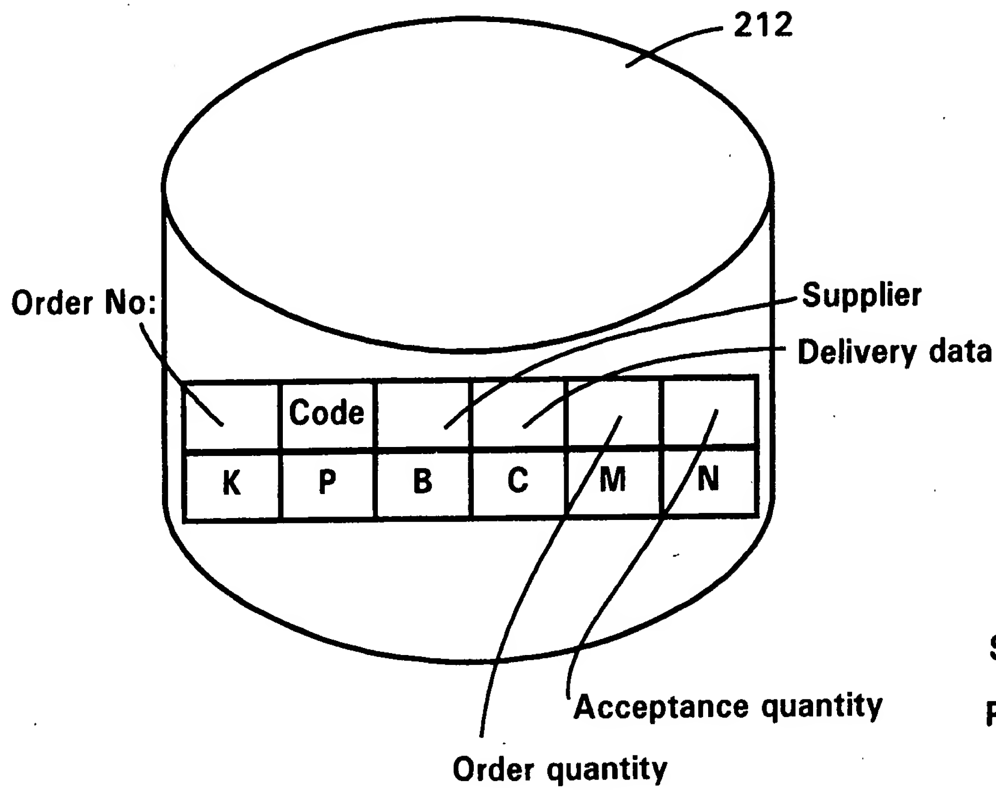
Parts Constitution data table

FIG.37



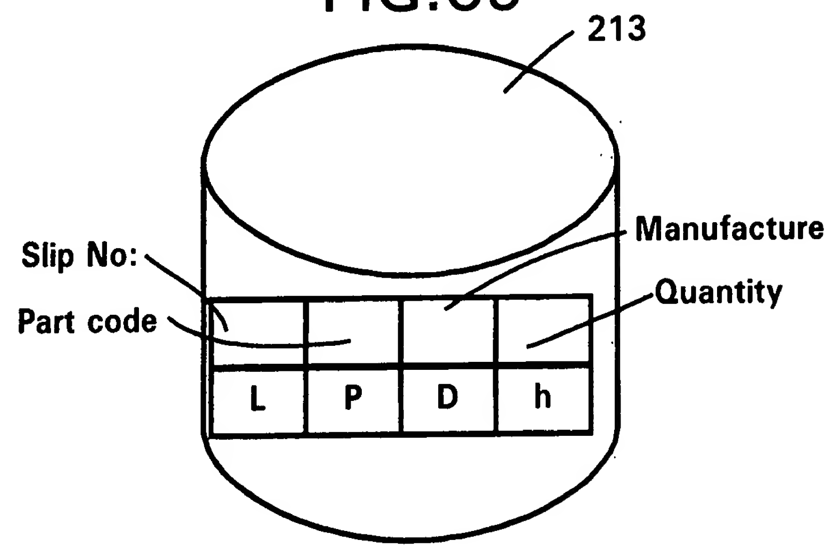
Parts processing data table

FIG.38



Parts order data table

FIG.39



Parts release data table

FIG.40

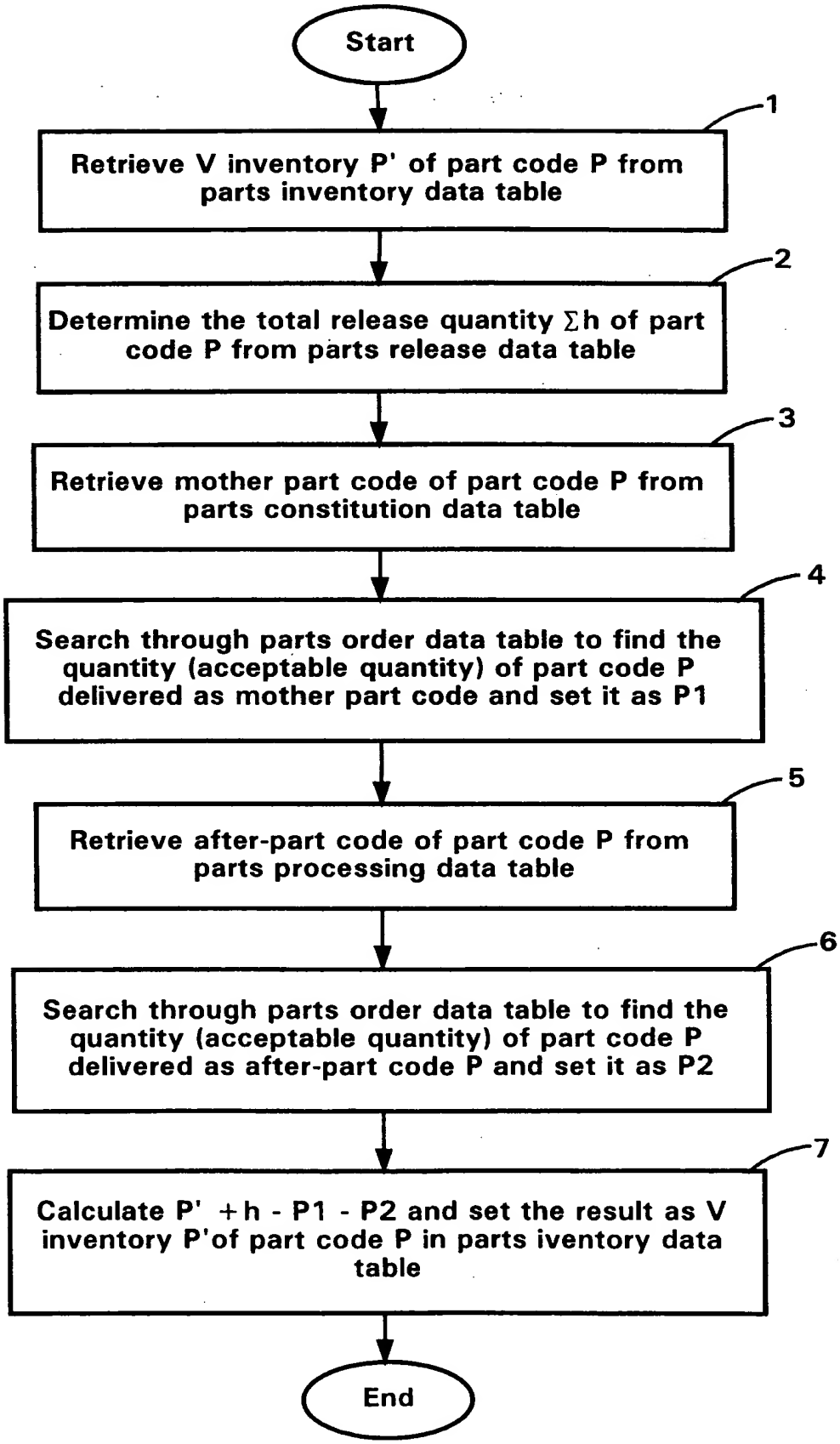

Start
1
Retrieve V inventory P' of part code P from parts inventory data table
2
Determine the total release quantity Σh of part code P from parts release data table
3
Retrieve mother part code of part code P from parts constitution data table
4
Search through parts order data table to find the quantity (acceptable quantity) of part code P delivered as mother part code and set it as P1
5
Retrieve after-part code of part code P from parts processing data table
6
Search through parts order data table to find the quantity (acceptable quantity) of part code P delivered as after-part code P and set it as P2
7
Calculate P' +h - P1 - P2 and set the result as V inventory P'of part code P in parts iventory data table
End

FIG.41

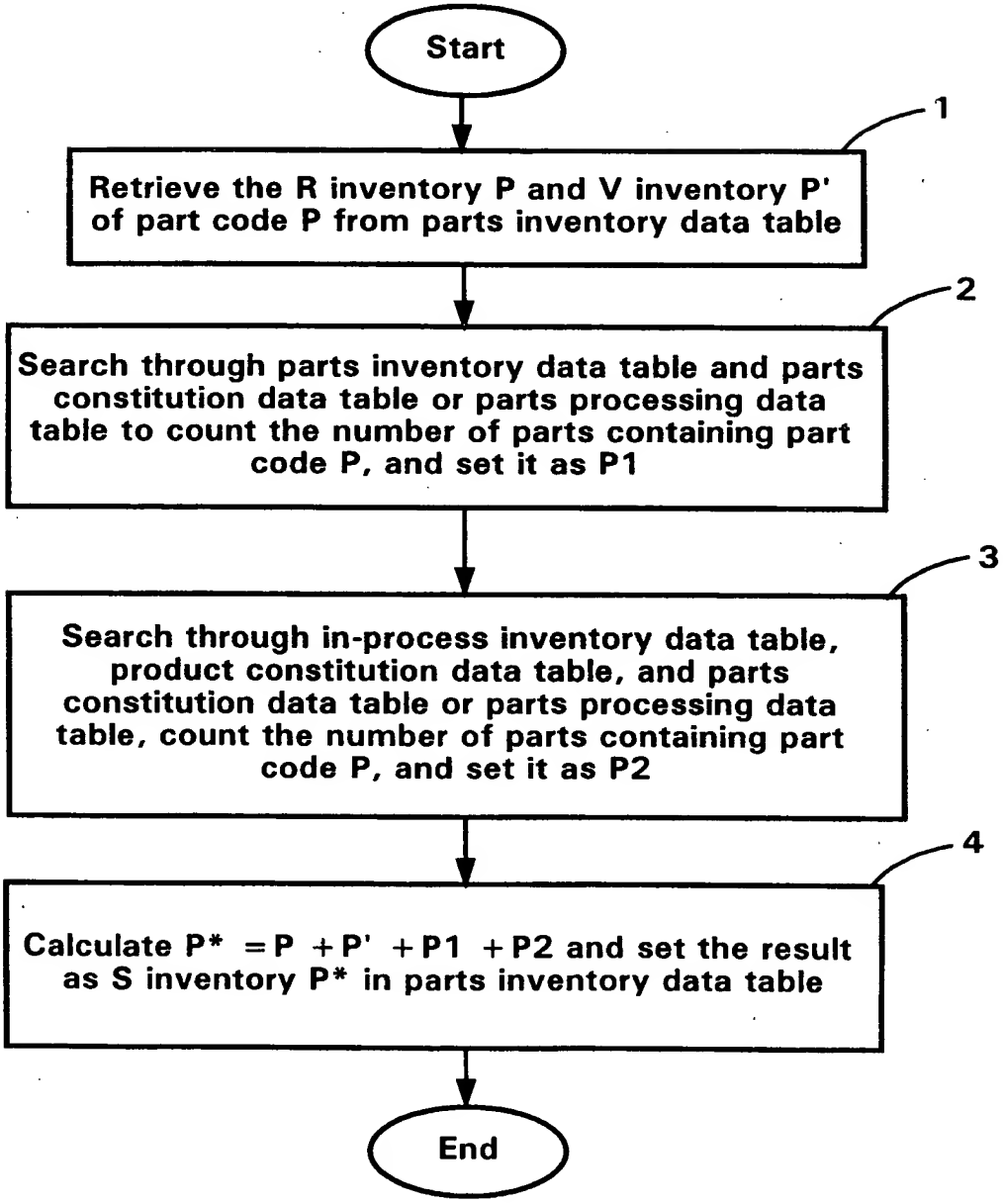
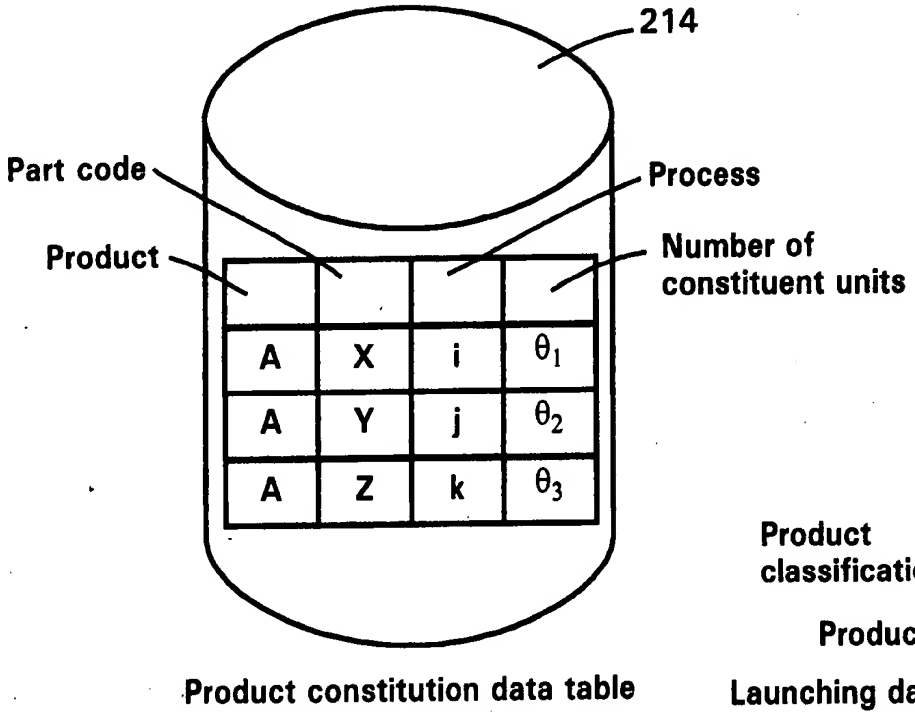
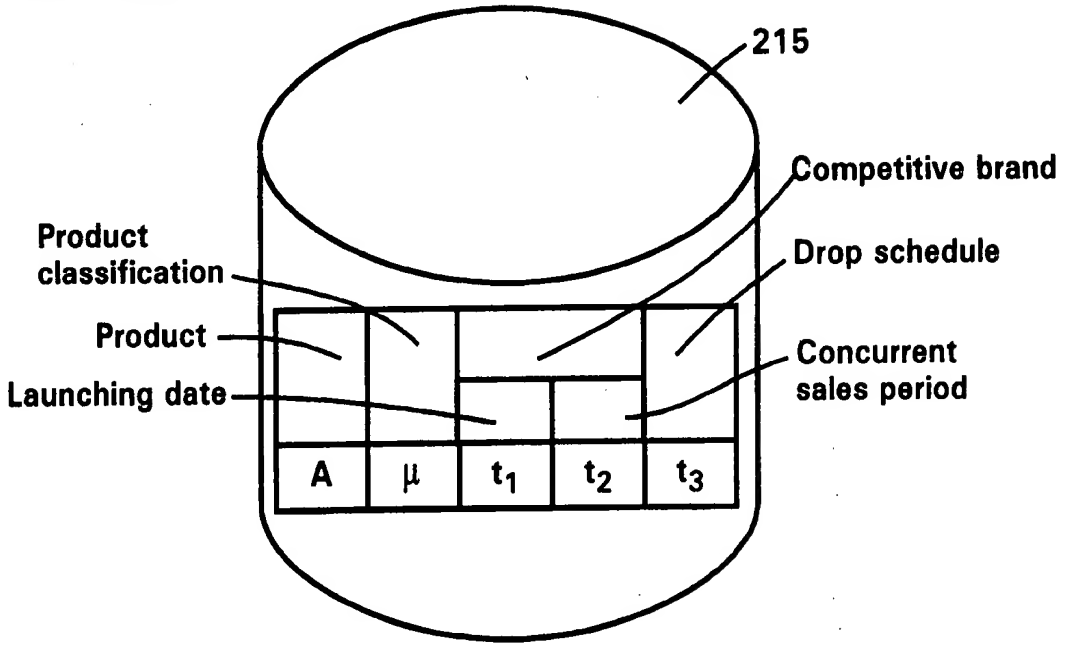

Start
1
Retrieve the R inventory P and V inventory P' of part code P from parts inventory data table
2
Search through parts inventory data table and parts constitution data table or parts processing data table to count the number of parts containing part code P, and set it as P1
3
Search through in-process inventory data table, product constitution data table, and parts constitution data table or parts processing data table, count the number of parts containing part code P, and set it as P2
4
Calculate P* = P + P' + P1 + P2 and set the result as S inventory P* in parts inventory data table
End

FIG.42



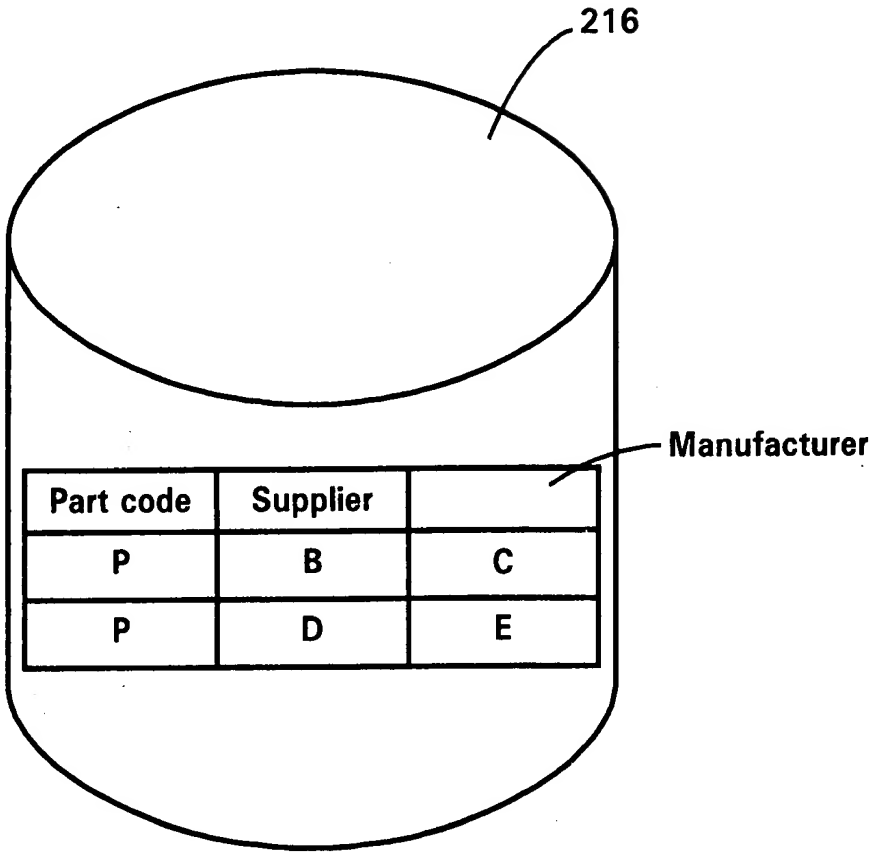
Product constitution data table

FIG.43



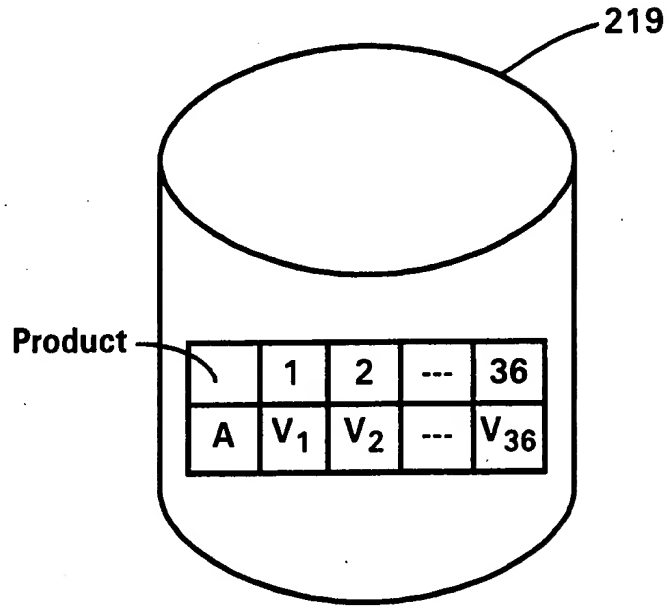
Product attribute data table

FIG.44



Parts attribute data table

FIG.45



Product sales data table

FIG.47

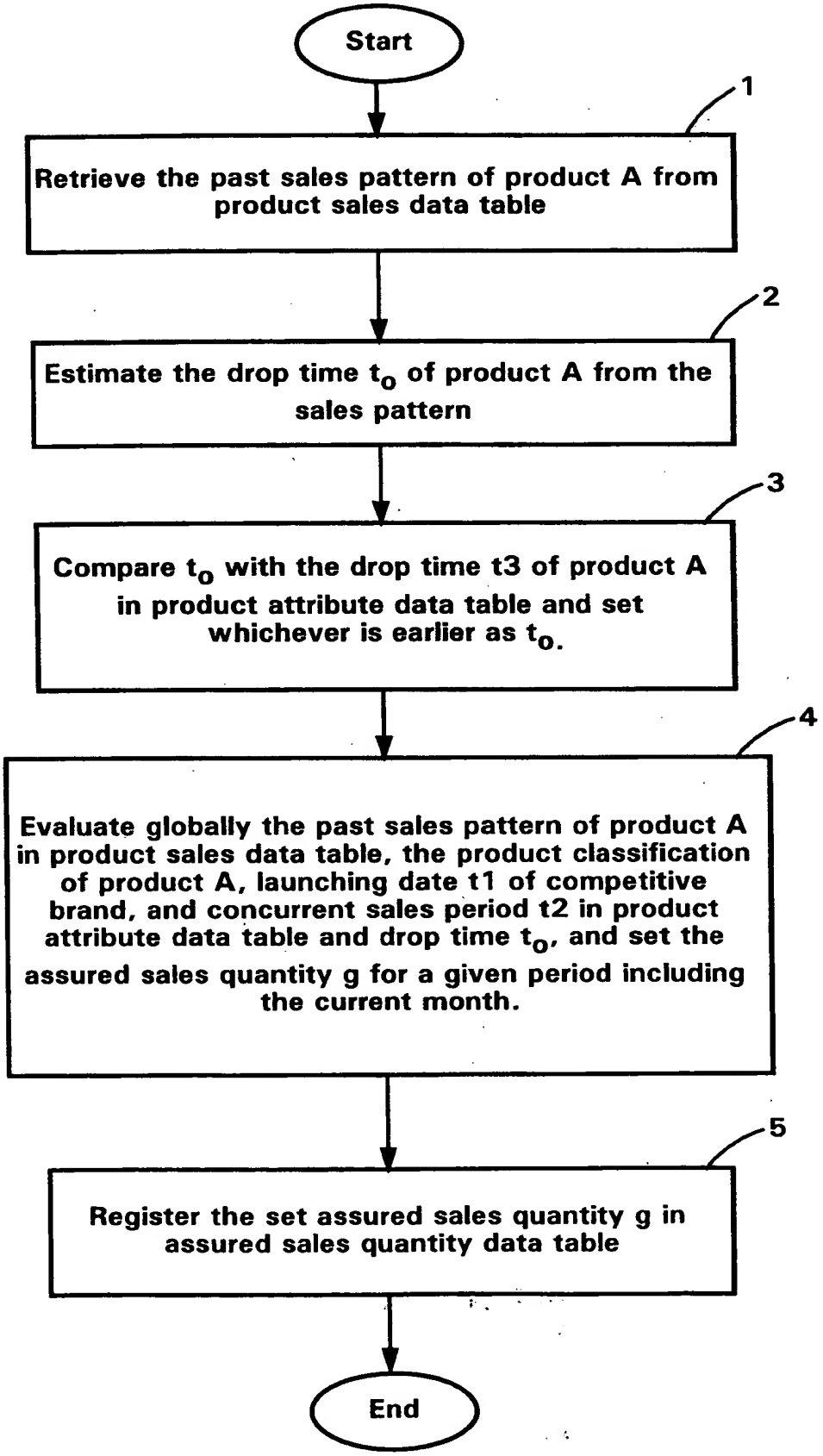
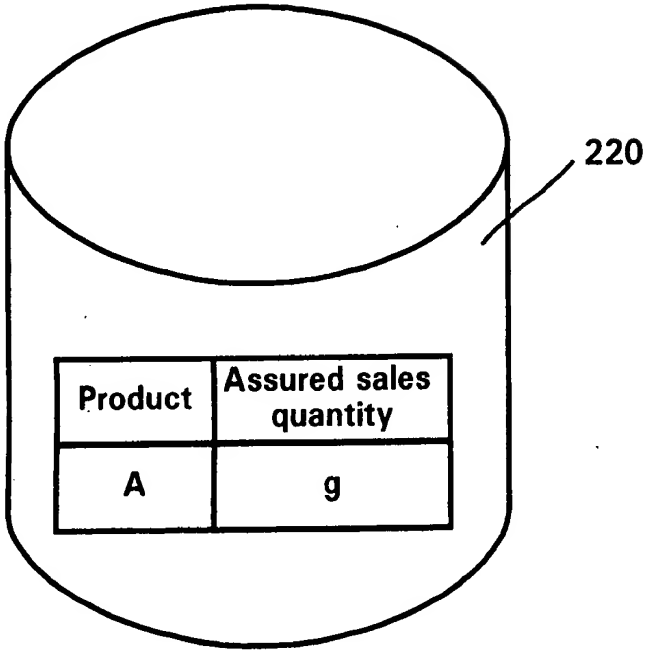
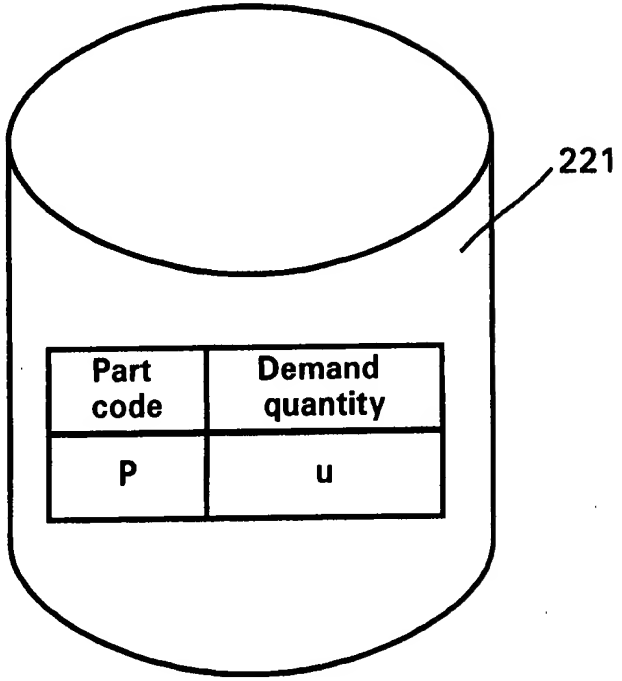

Start
1
Retrieve the past sales pattern of product A from product sales data table
2
Estimate the drop time t_o of product A from the sales pattern
3
Compare t_o with the drop time t3 of product A in product attribute data table and set whichever is earlier as t_o.
4
Evaluate globally the past sales pattern of product A in product sales data table, the product classification of product A, launching date t1 of competitive brand, and concurrent sales period t2 in product attribute data table and drop time t_o, and set the assured sales quantity g for a given period including the current month.
5
Register the set assured sales quantity g in assured sales quantity data table
End

FIG.46



Assured sales quantity data table

FIG.48



Parts demand quantity data table

FIG.49A

220

Product	Assured sales quantity
A	10
B	25
C	5

Assured sales quantity data table

FIG.49B

214

Product	Part code	
A	q1	2
A	q2	3
A	q3	1
B	q1	1
B	q4	3
C	q5	1
C	q6	2

Product constitution data table

FIG.49C

210

Mother part code	Daughter part code	Number of constituent units
q1	q7	1
q1	q8	1
q2	q8	2
q2	q10	1
q4	q7	1
q4	q9	2
q6	q9	3
q6	q10	1
q6	q15	2
q10	q12	1
q10	q13	3

Parts constitution data table

FIG.49D

Before - part code	After - part code
q11	q7
q11	q12
q14	q5

211

Parts processing data table

FIG.50

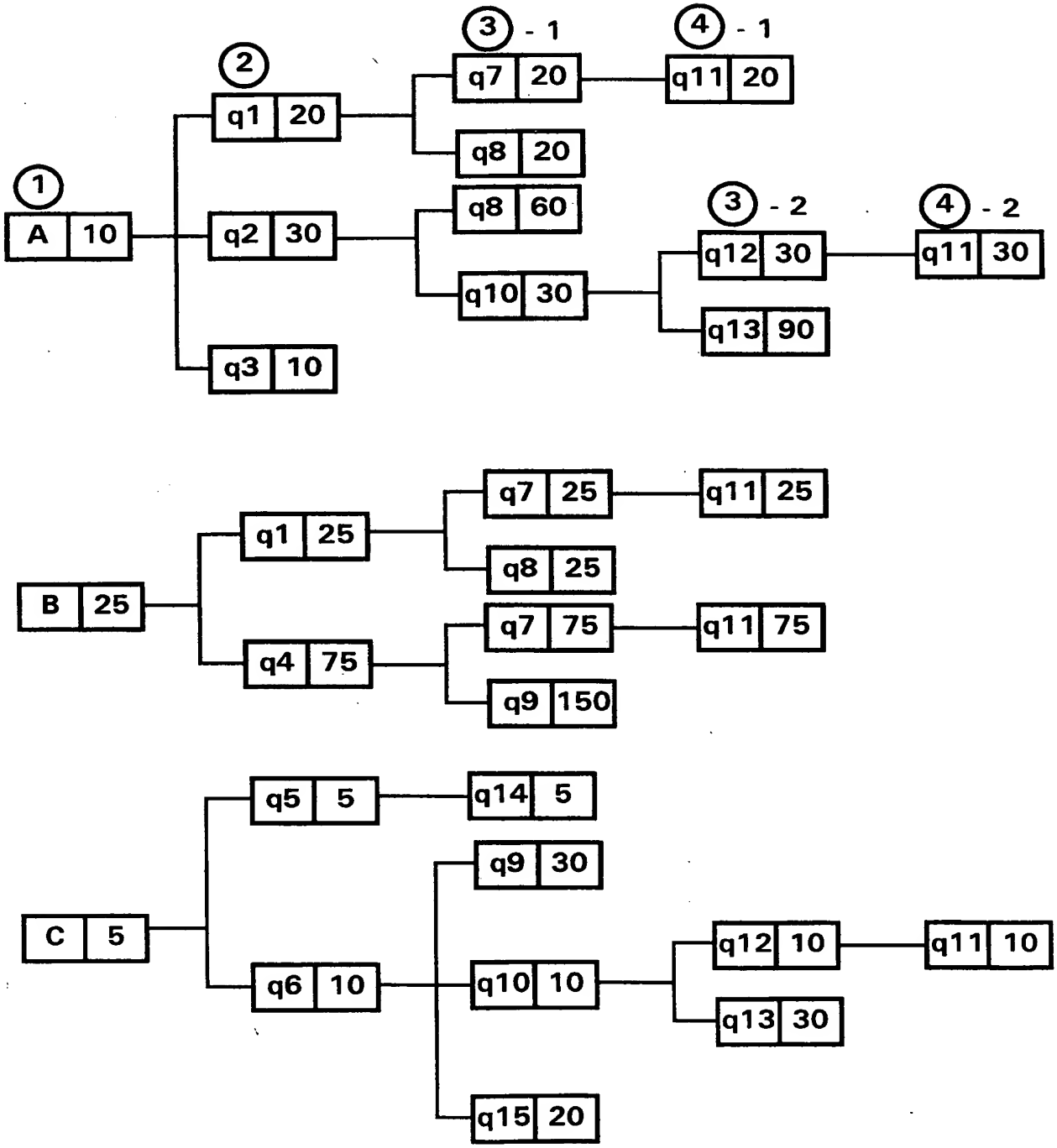


FIG.51

221

PART CODE	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	q11	q12	q13	q14	q15
DEMAND QUANTITY	45	30	10	75	5	10	120	105	180	40	160	40	120	5	20

Parts demand quantity data table

FIG.52

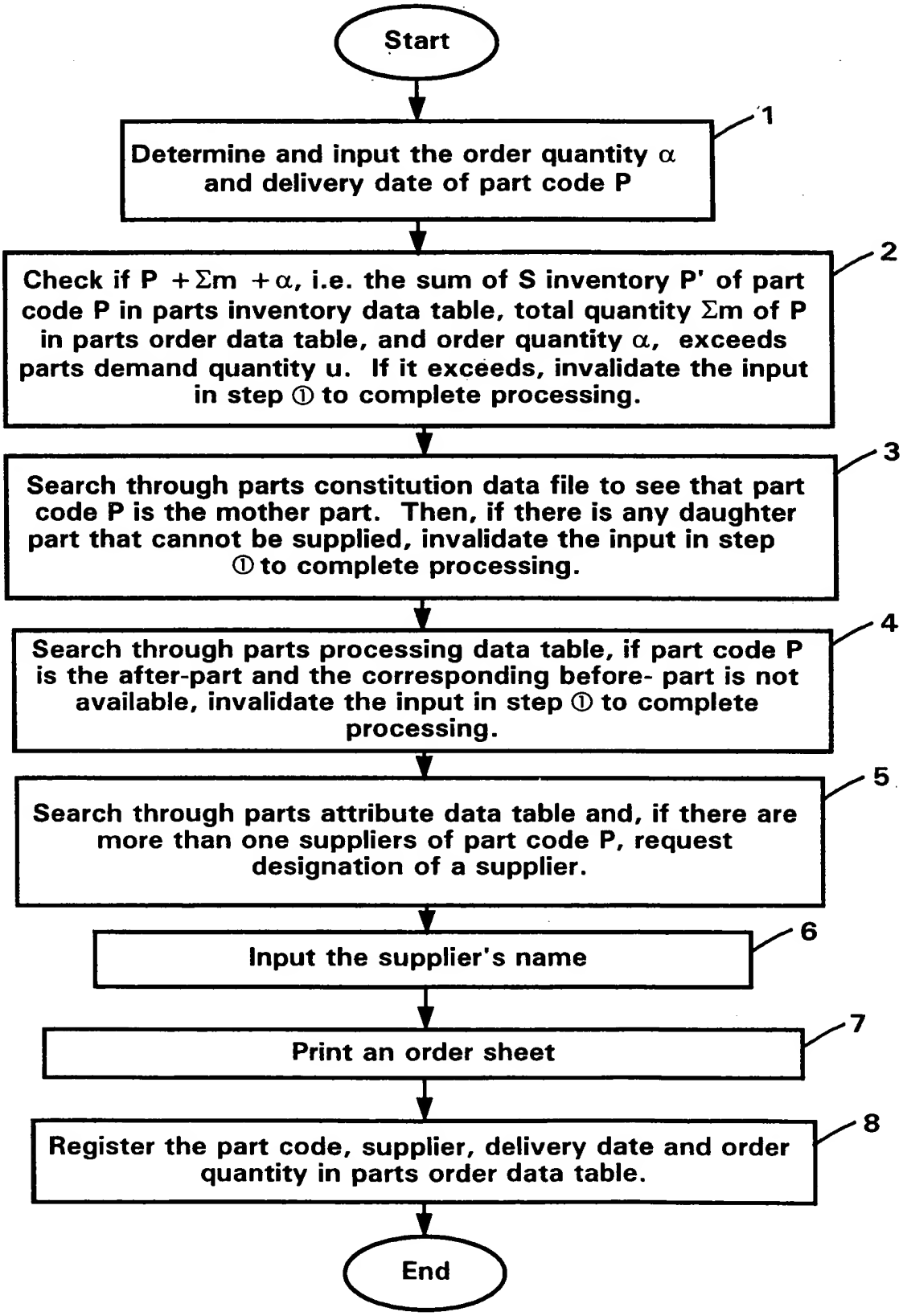

Start
Determine and input the order quantity α and delivery date of part code P
1
Check if P +Σm +α, i.e. the sum of S inventory P' of part code P in parts inventory data table, total quantity Σm of P in parts order data table, and order quantity α, exceeds parts demand quantity u. If it exceeds, invalidate the input in step ① to complete processing.
2
Search through parts constitution data file to see that part code P is the mother part. Then, if there is any daughter part that cannot be supplied, invalidate the input in step ① to complete processing.
3
Search through parts processing data table, if part code P is the after-part and the corresponding before- part is not available, invalidate the input in step ① to complete processing.
4
Search through parts attribute data table and, if there are more than one suppliers of part code P, request designation of a supplier.
5
Input the supplier's name
6
Print an order sheet
7
Register the part code, supplier, delivery date and order quantity in parts order data table.
8
End

FIG.53

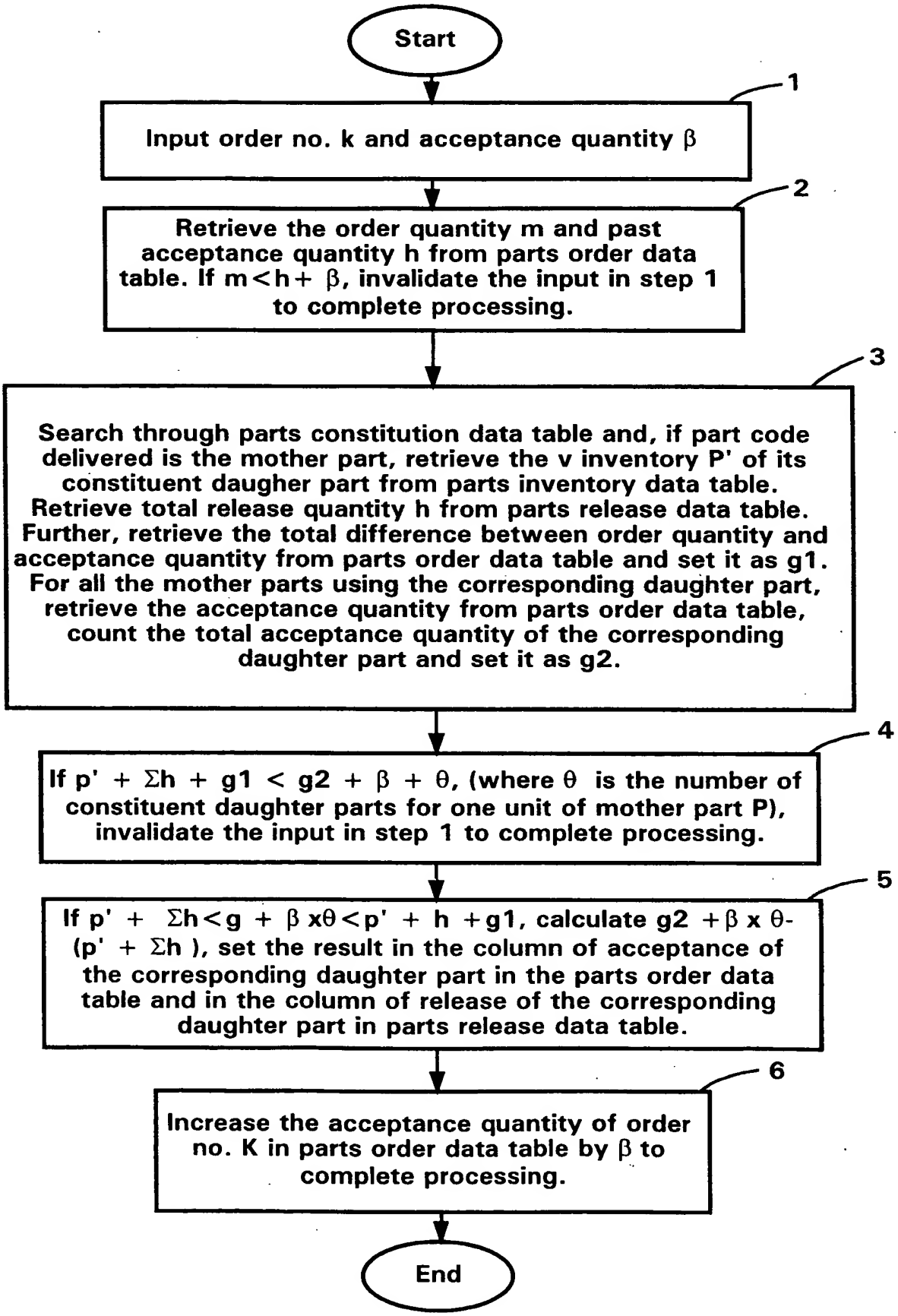

Start
1
Input order no. k and acceptance quantity β
2
Retrieve the order quantity m and past acceptance quantity h from parts order data table. If m<h+ β, invalidate the input in step 1 to complete processing.
3
Search through parts constitution data table and, if part code delivered is the mother part, retrieve the v inventory P' of its constituent daugher part from parts inventory data table. Retrieve total release quantity h from parts release data table. Further, retrieve the total difference between order quantity and acceptance quantity from parts order data table and set it as g1. For all the mother parts using the corresponding daughter part, retrieve the acceptance quantity from parts order data table, count the total acceptance quantity of the corresponding daughter part and set it as g2.
4
If p' + Σh + g1 < g2 + β + θ, (where θ is the number of constituent daughter parts for one unit of mother part P), invalidate the input in step 1 to complete processing.
5
If p' + Σh<g + β xθ<p' + h +g1, calculate g2 +β x θ-(p' + Σh), set the result in the column of acceptance of the corresponding daughter part in the parts order data table and in the column of release of the corresponding daughter part in parts release data table.
6
Increase the acceptance quantity of order no. K in parts order data table by β to complete processing.
End

FIG.54

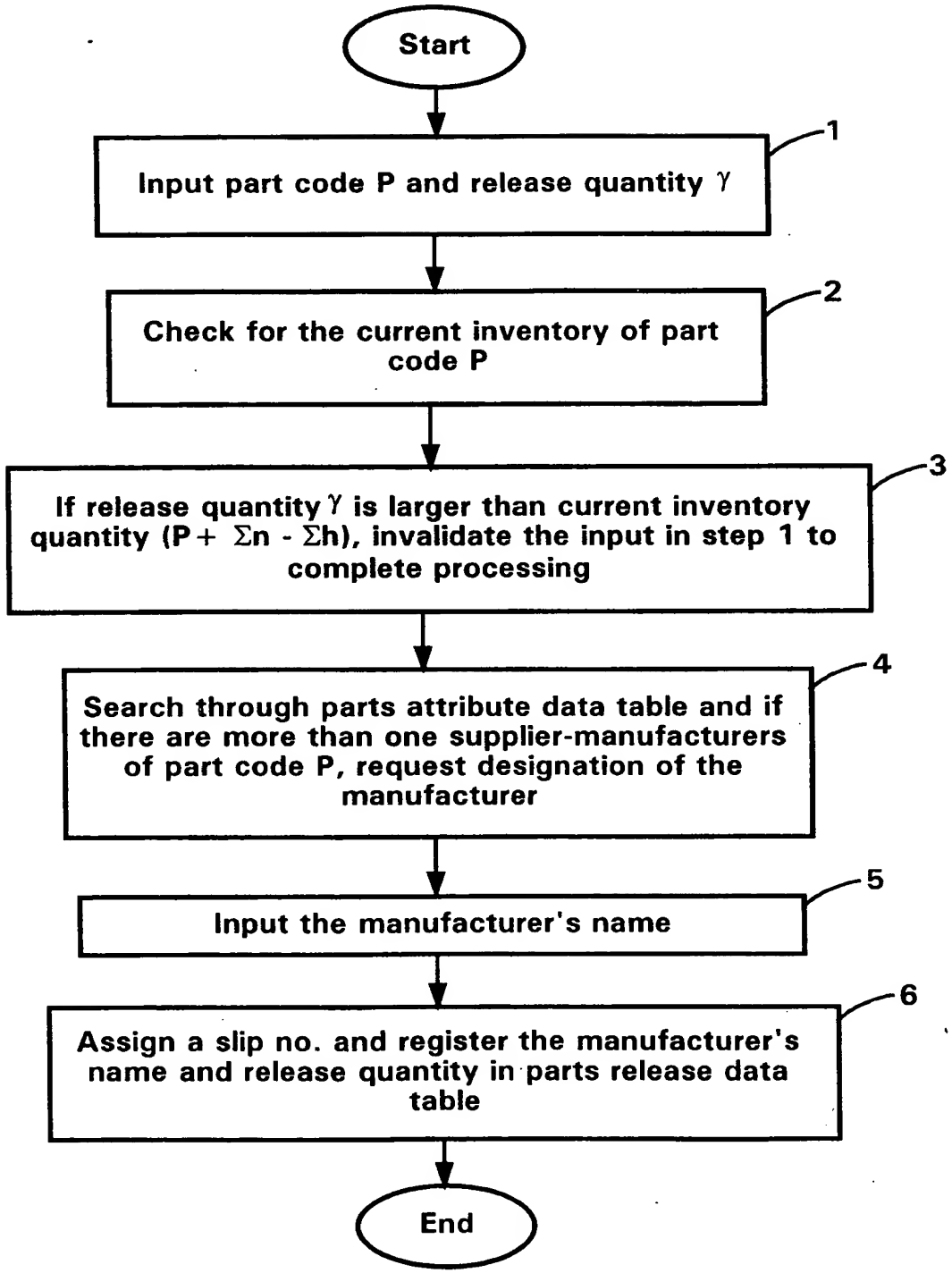
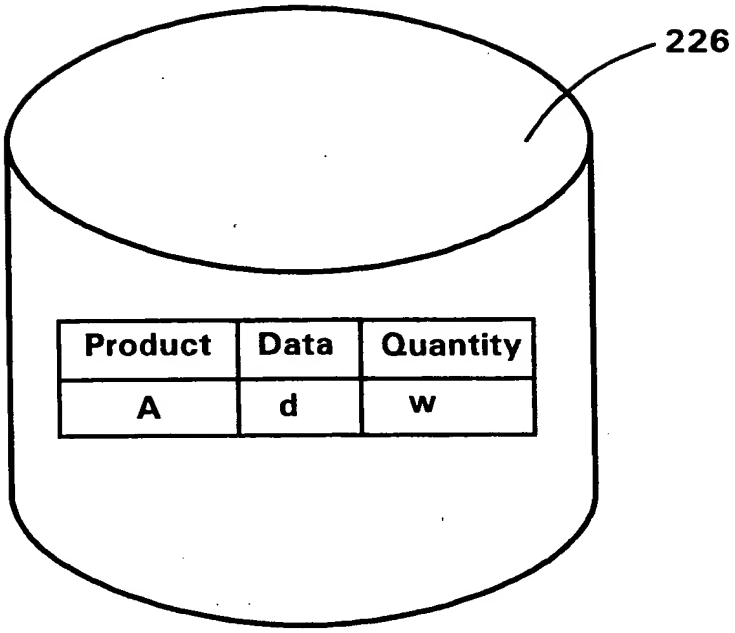

Start
Input part code P and release quantity γ
1
Check for the current inventory of part code P
2
If release quantity γ is larger than current inventory quantity (P + Σn - Σh), invalidate the input in step 1 to complete processing
3
Search through parts attribute data table and if there are more than one supplier-manufacturers of part code P, request designation of the manufacturer
4
Input the manufacturer's name
5
Assign a slip no. and register the manufacturer's name and release quantity in parts release data table
6
End

FIG.55



Production plan data table

FIG.56

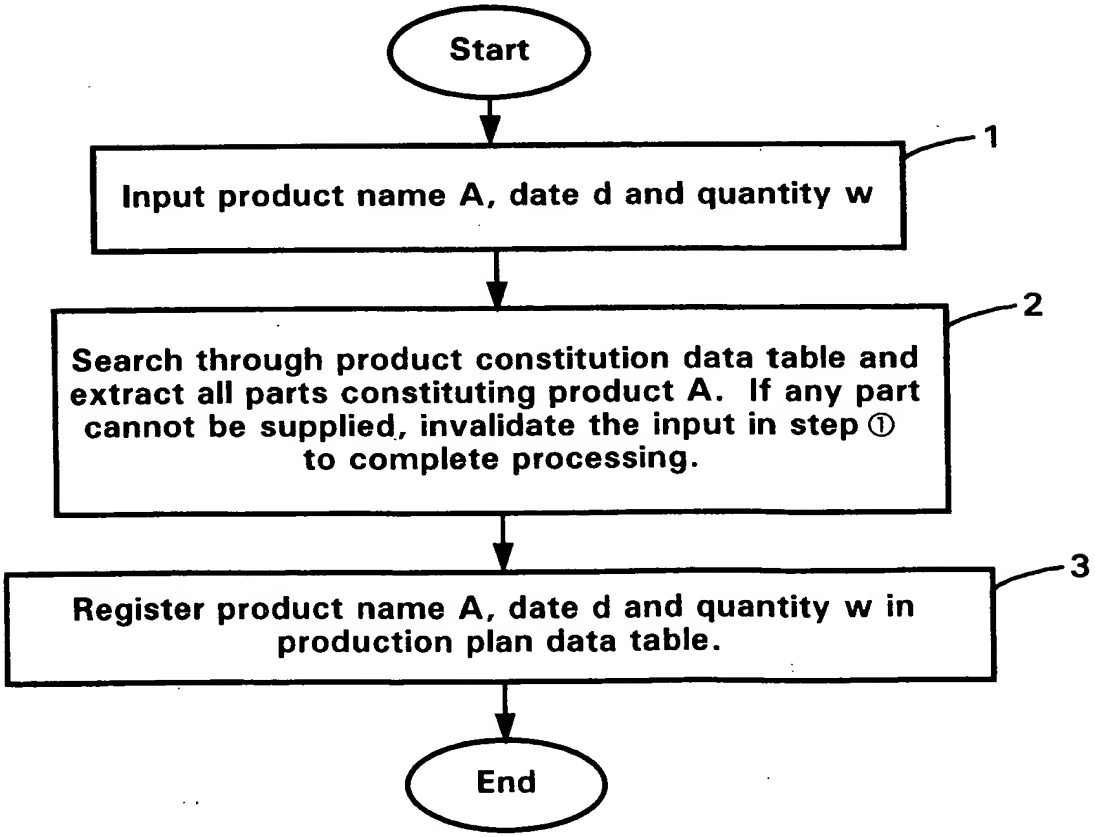


FIG.57

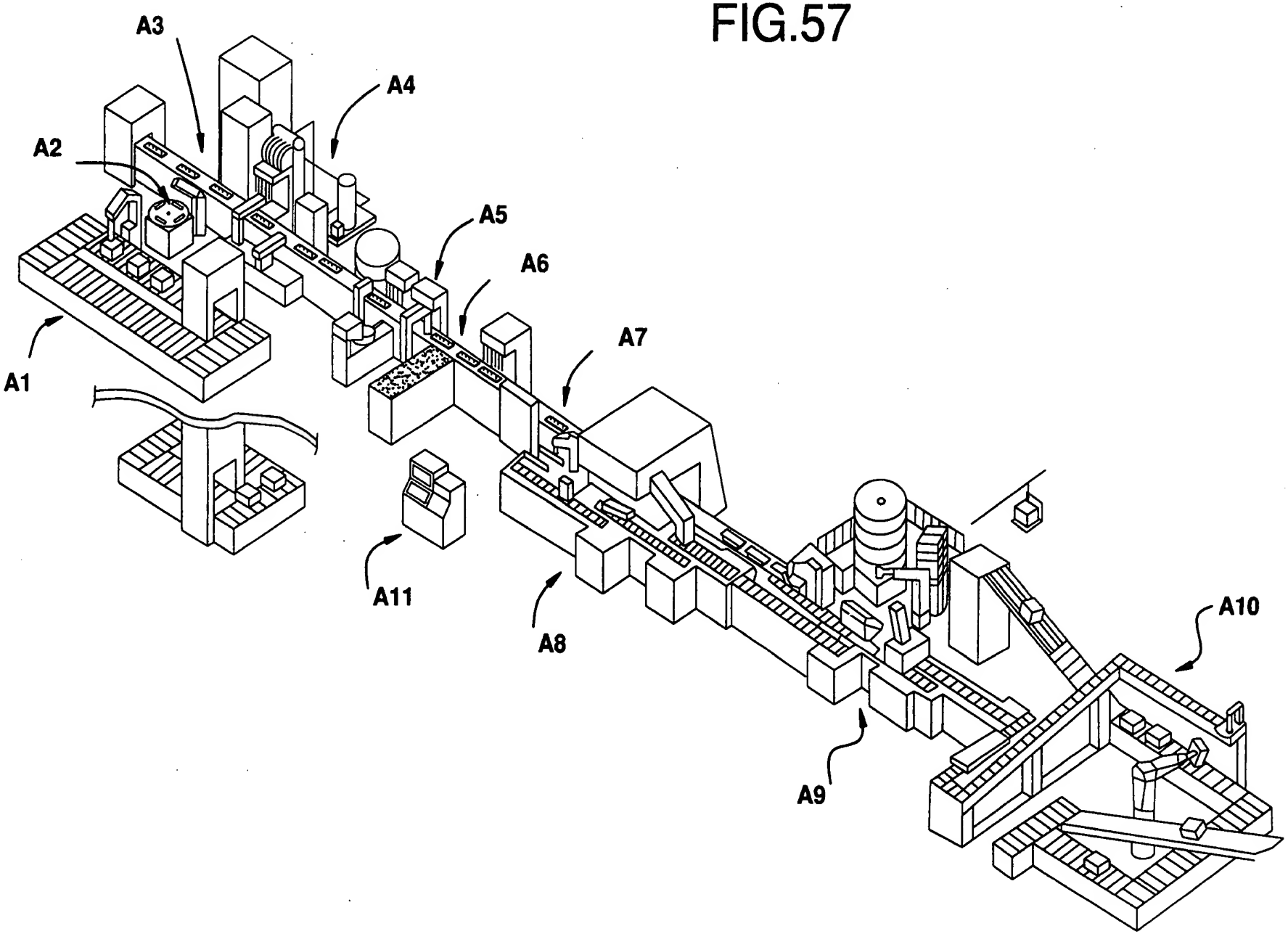


FIG.58